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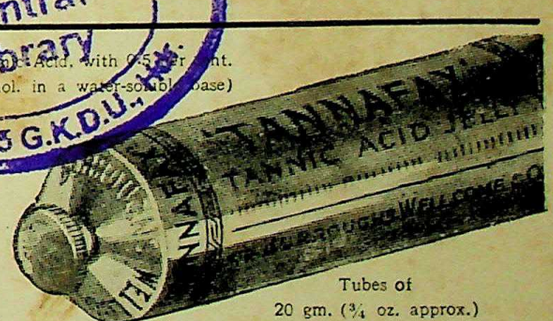

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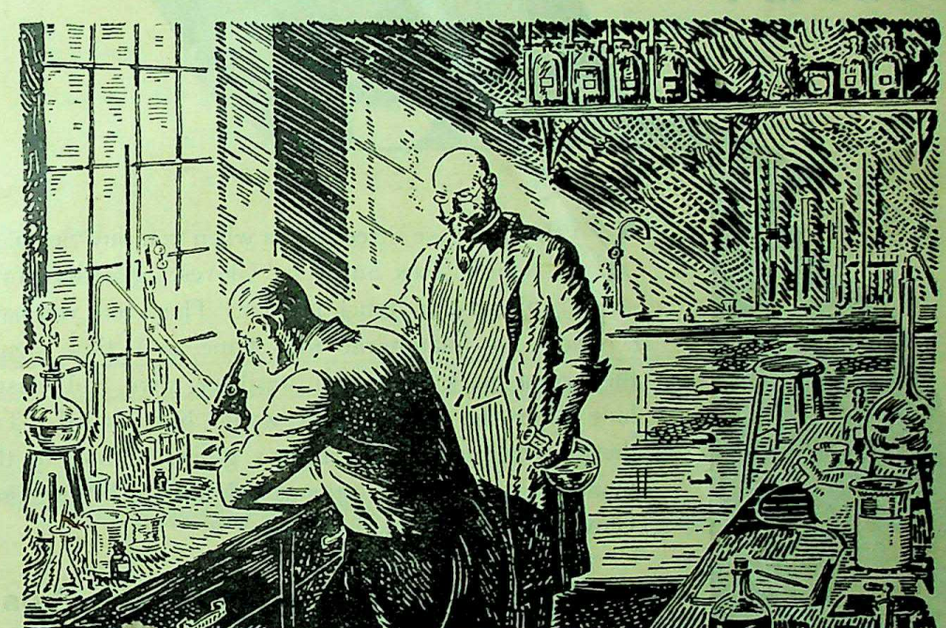

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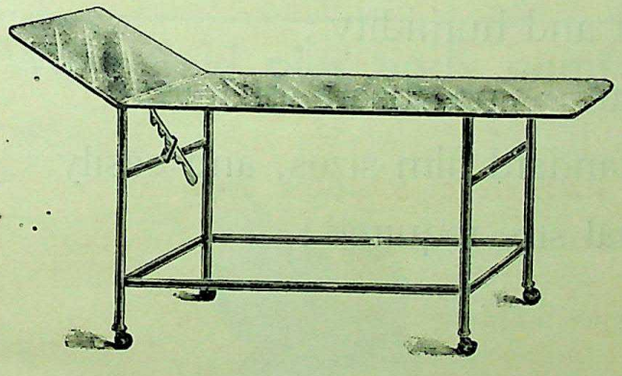

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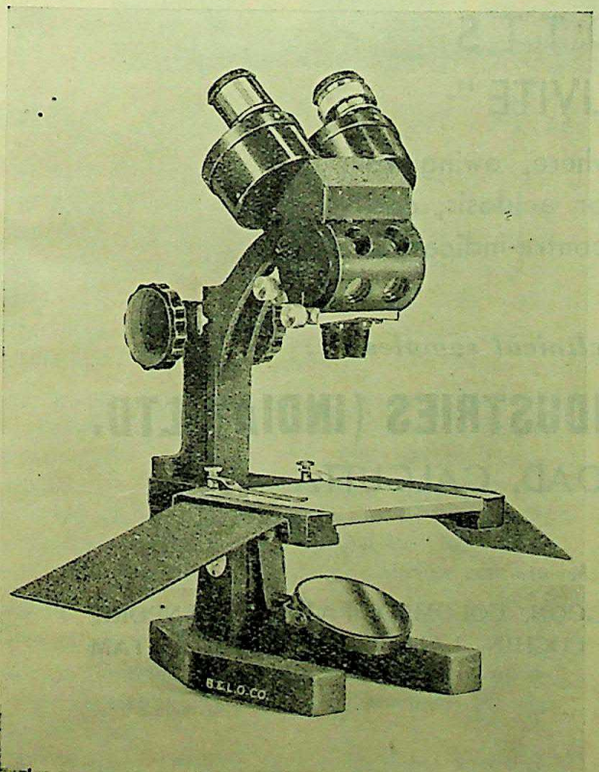

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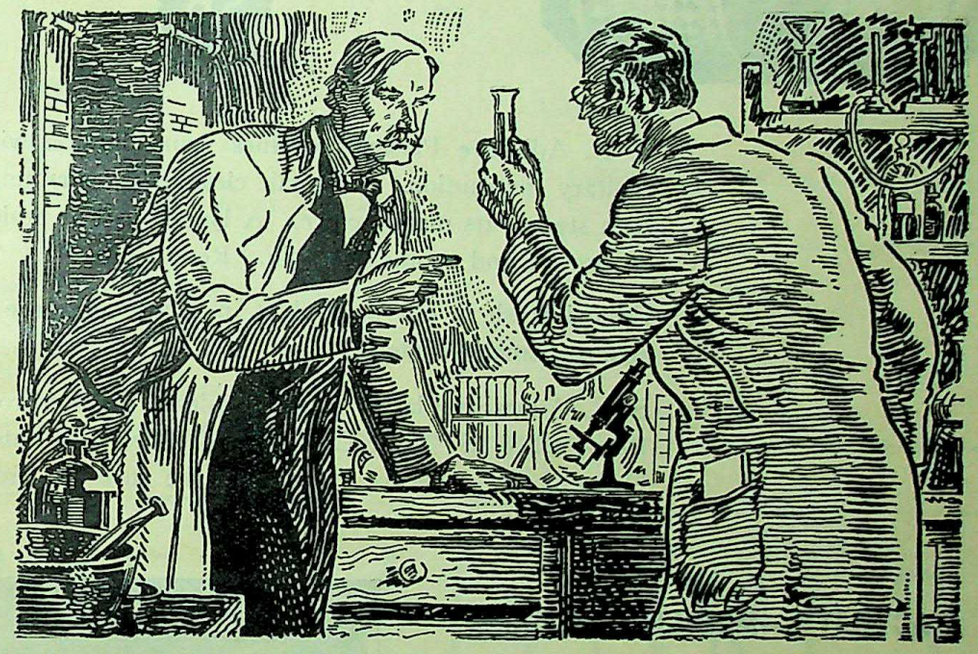

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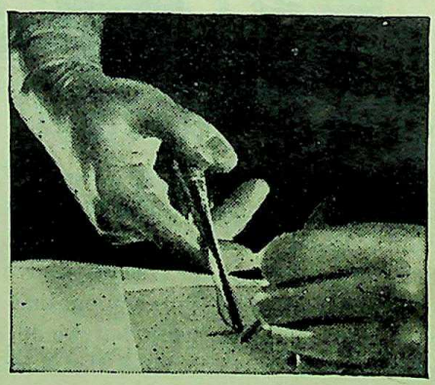

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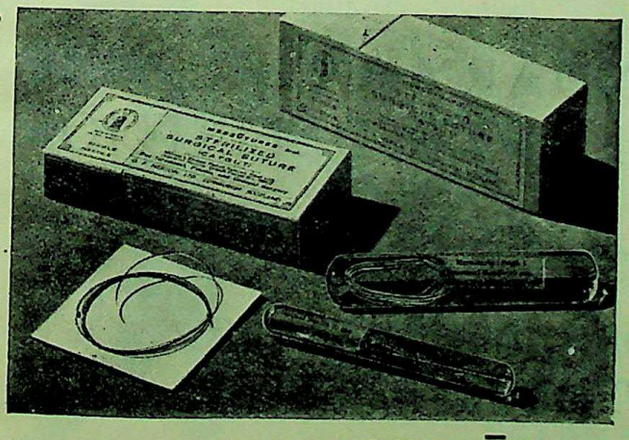

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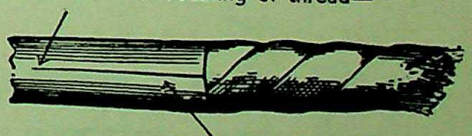

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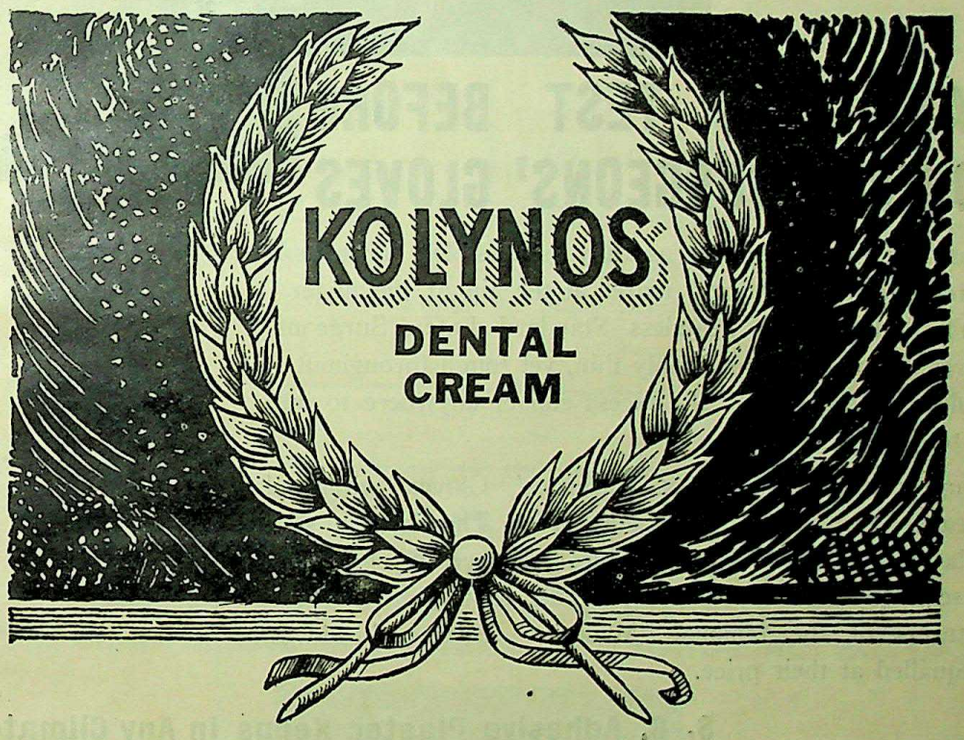

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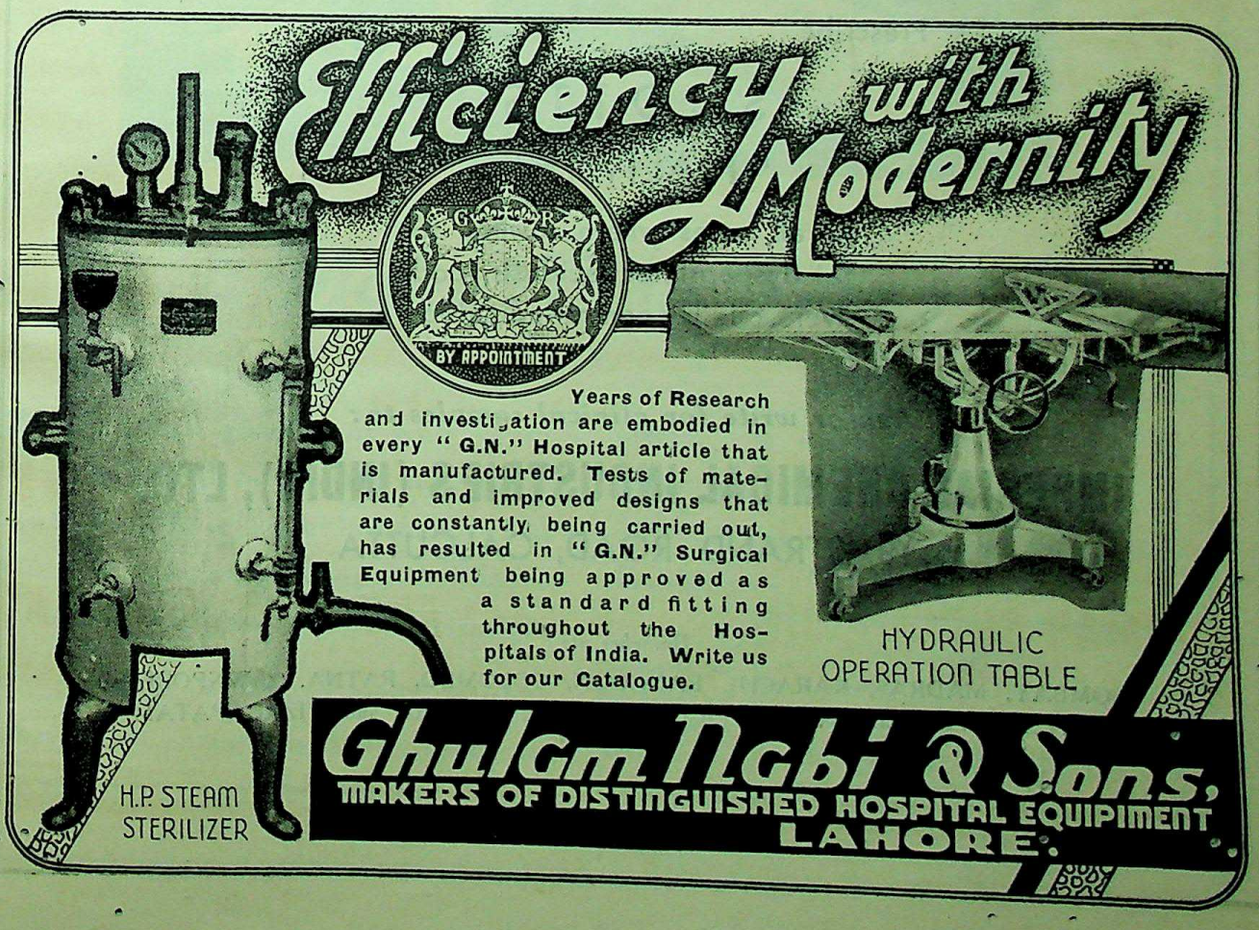

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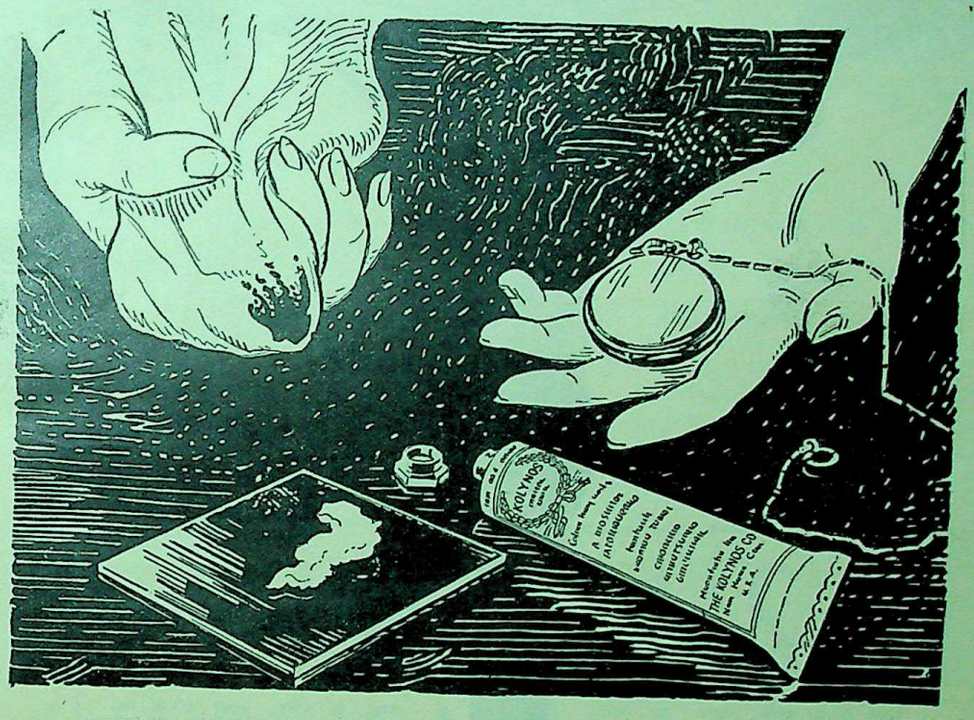

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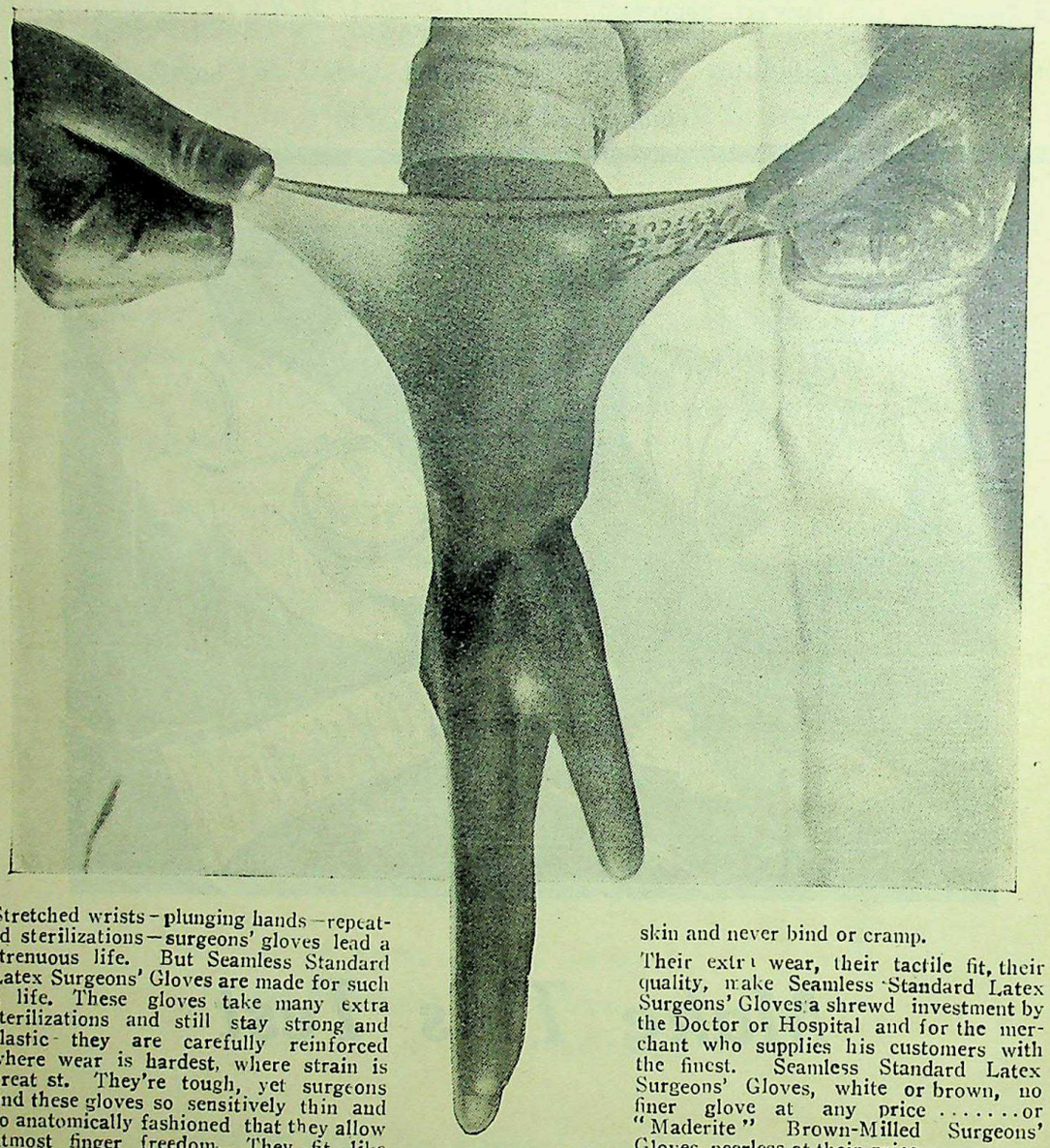

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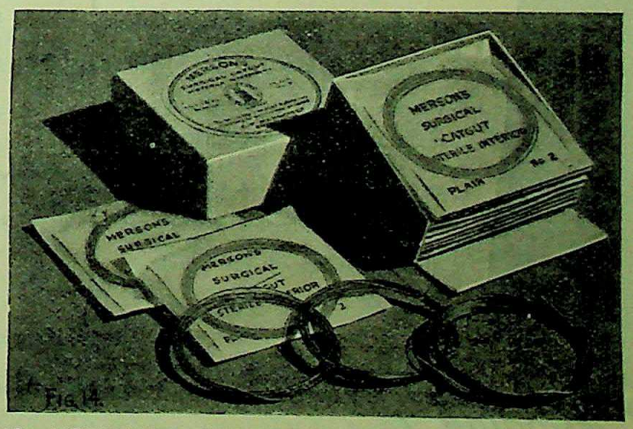

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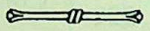

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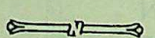

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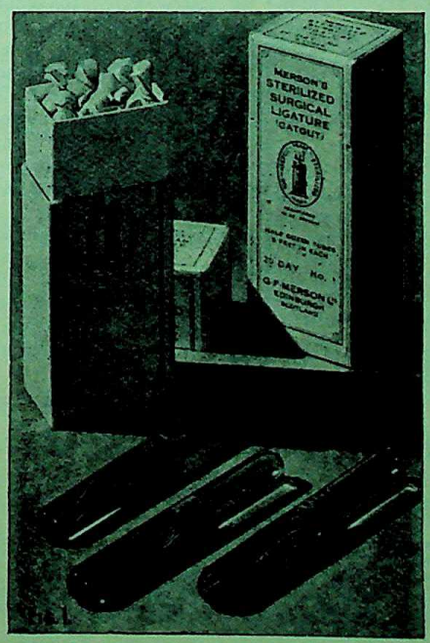

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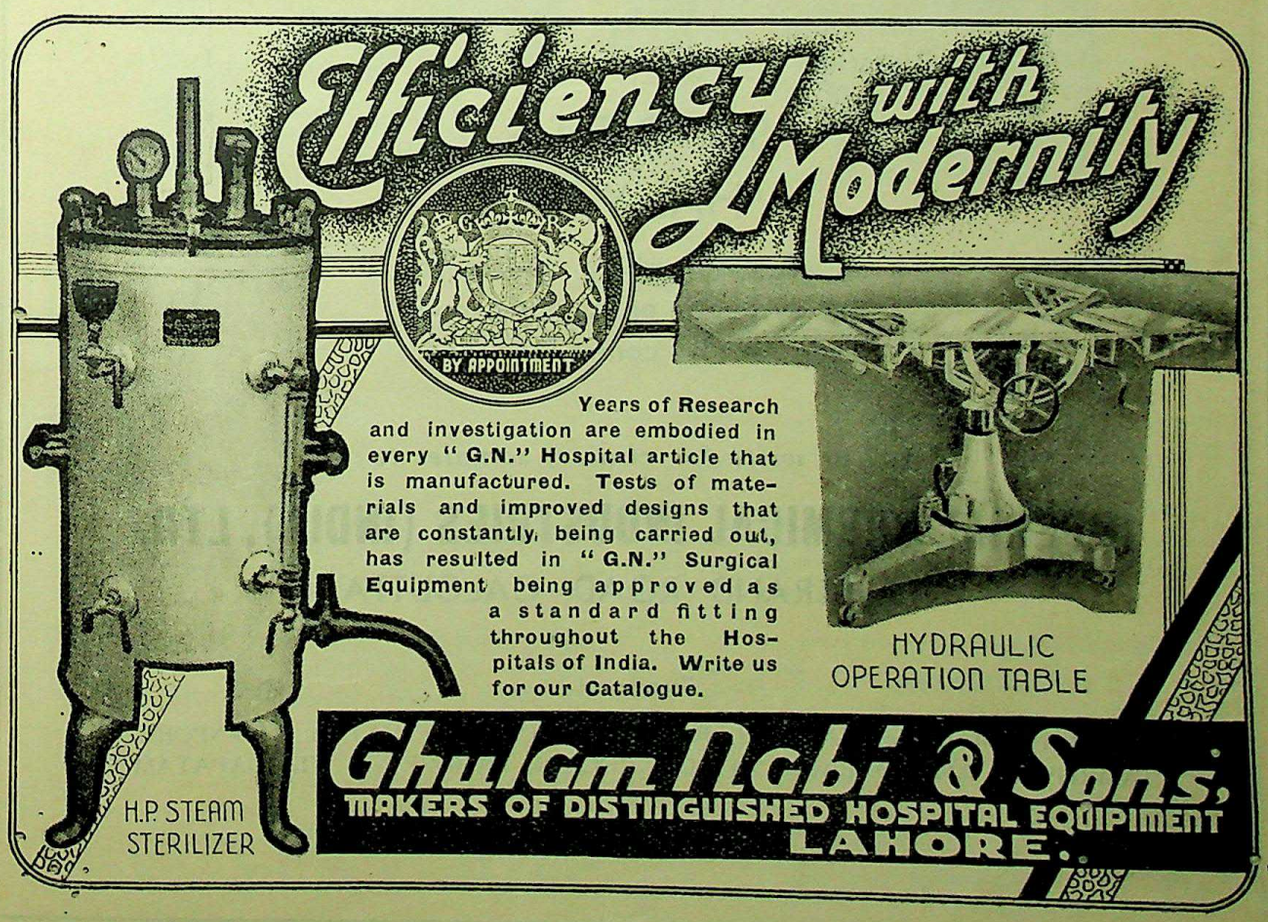

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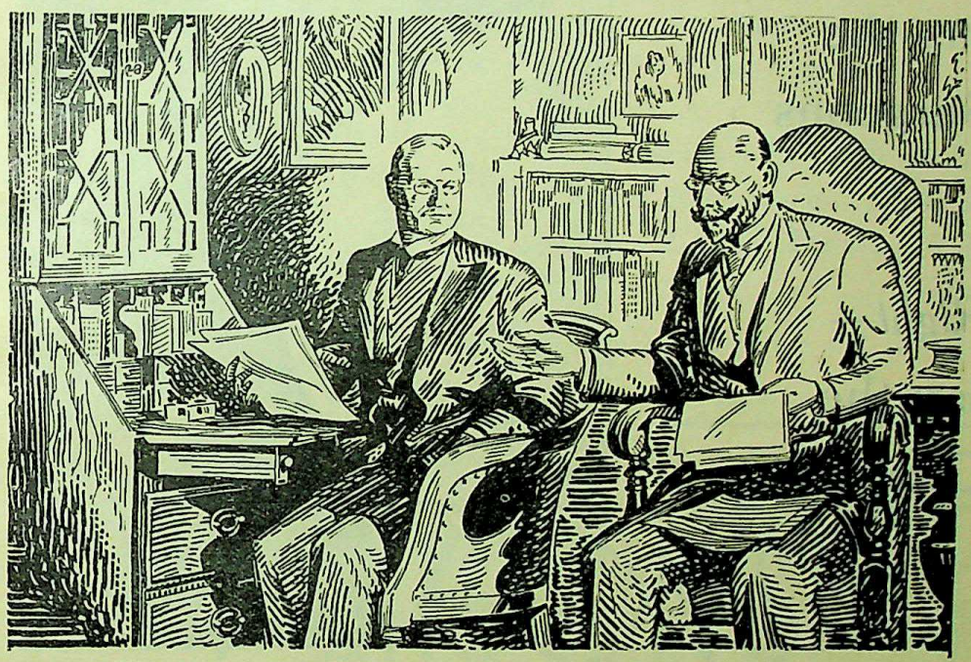

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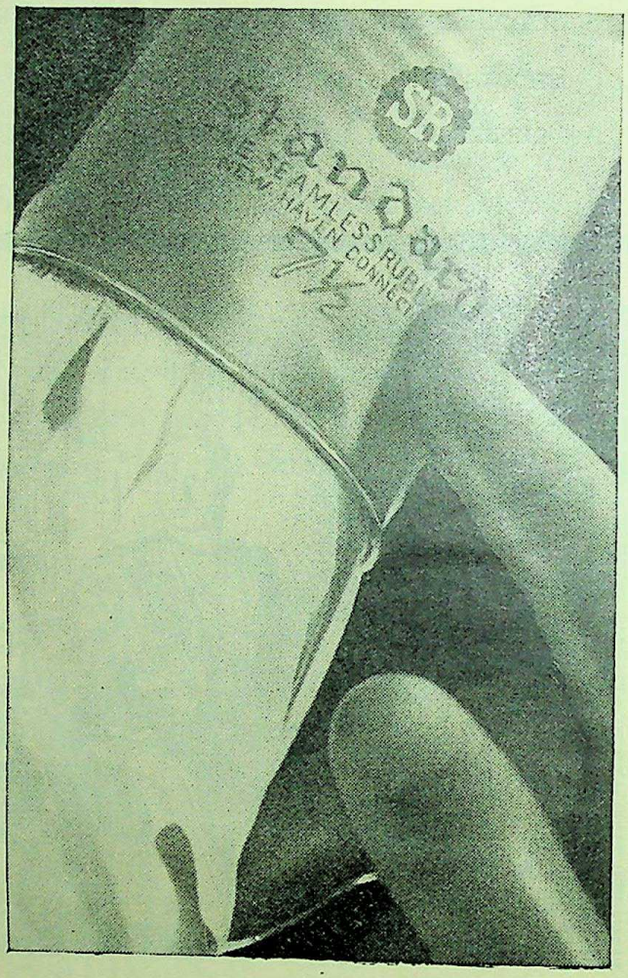

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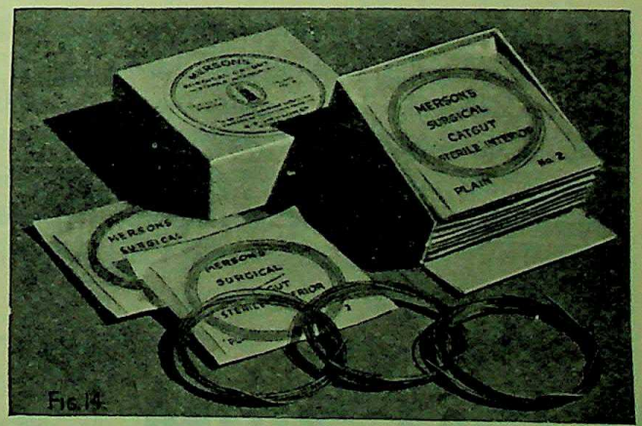

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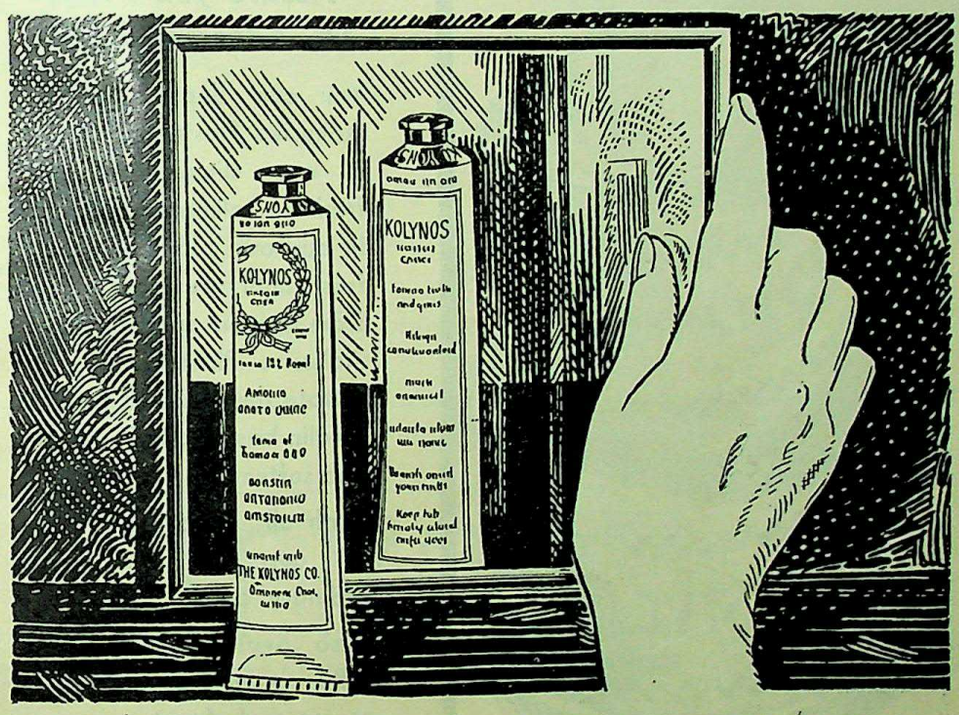

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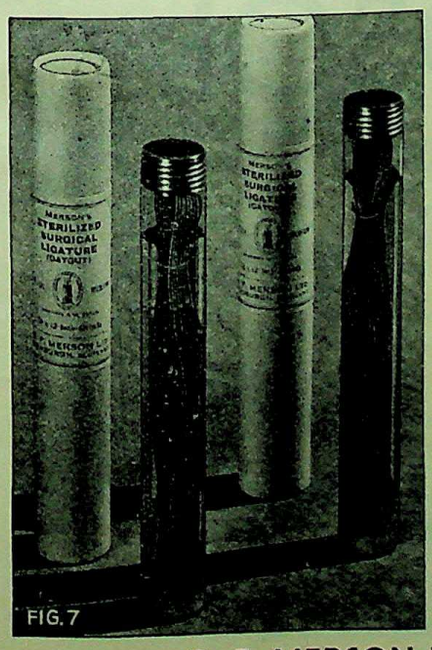

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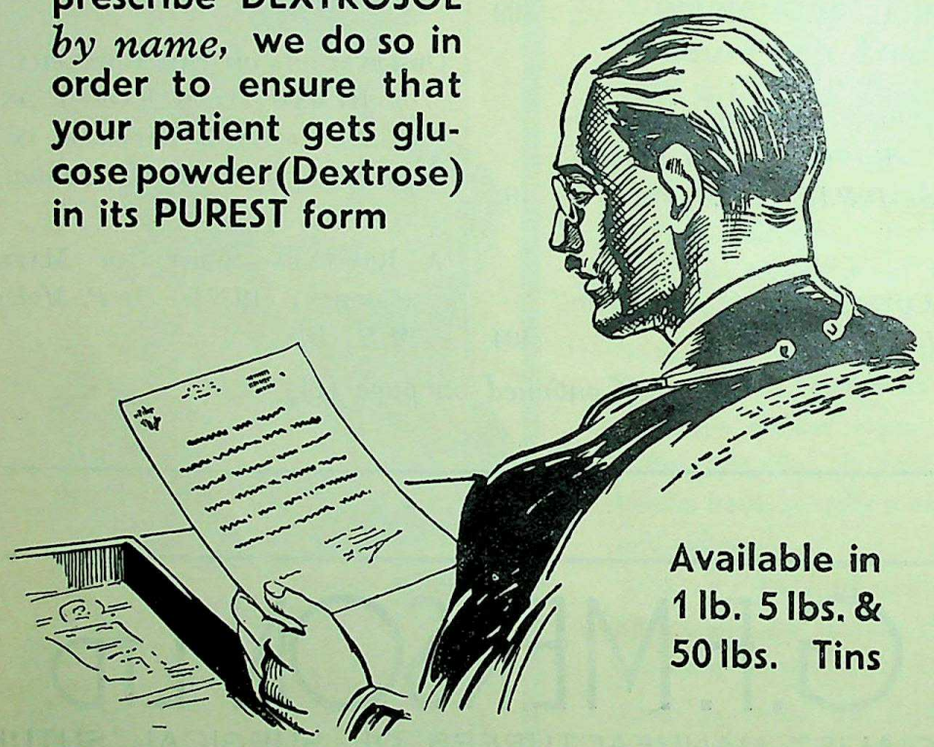

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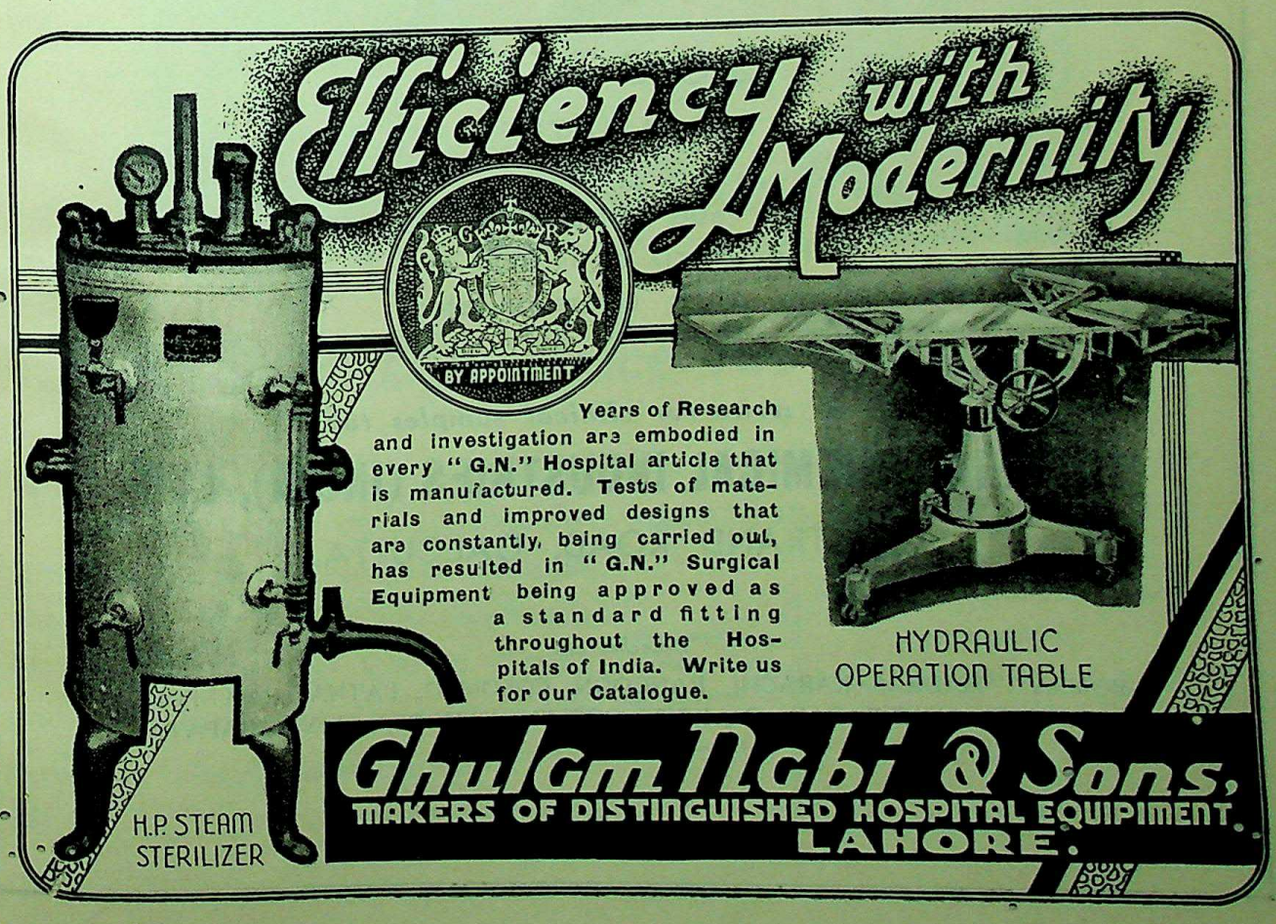

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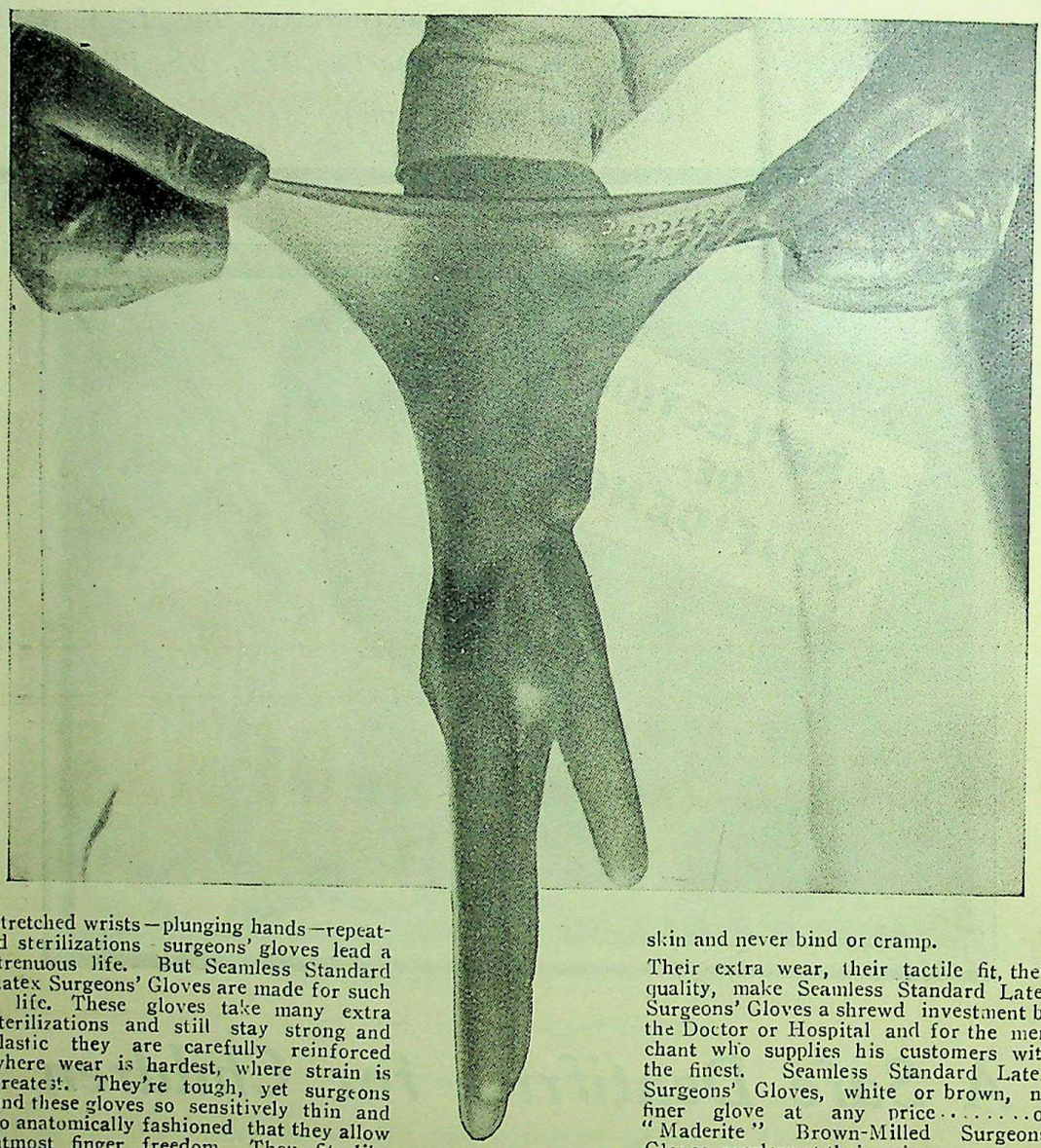

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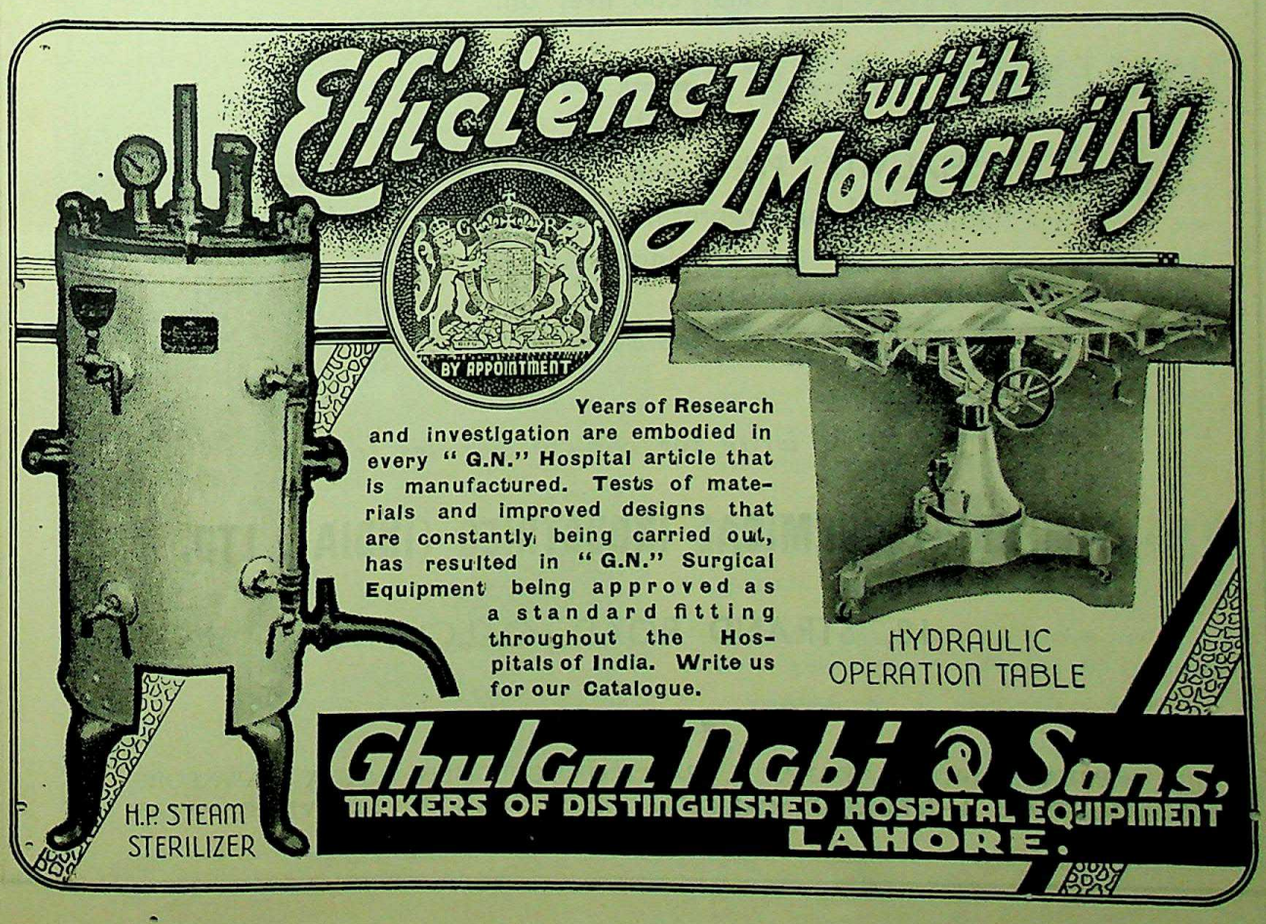

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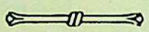

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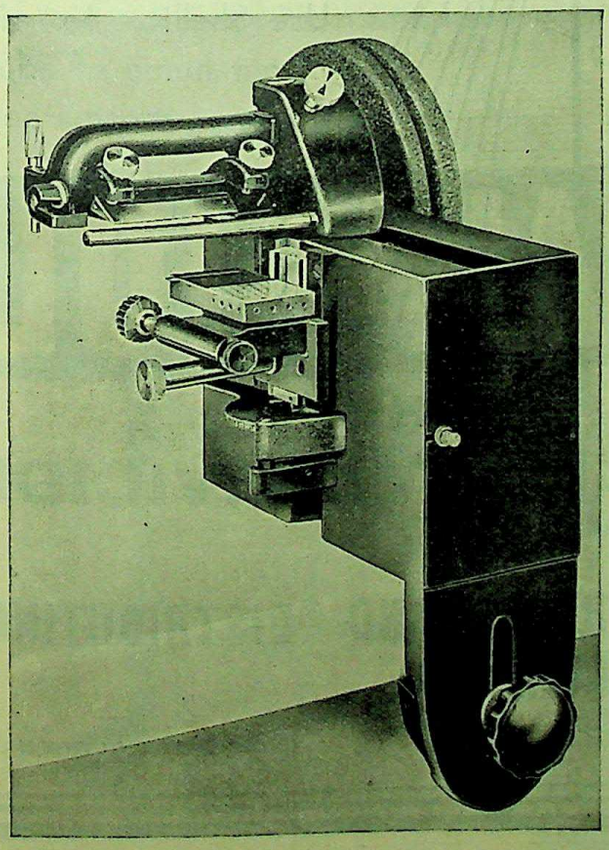

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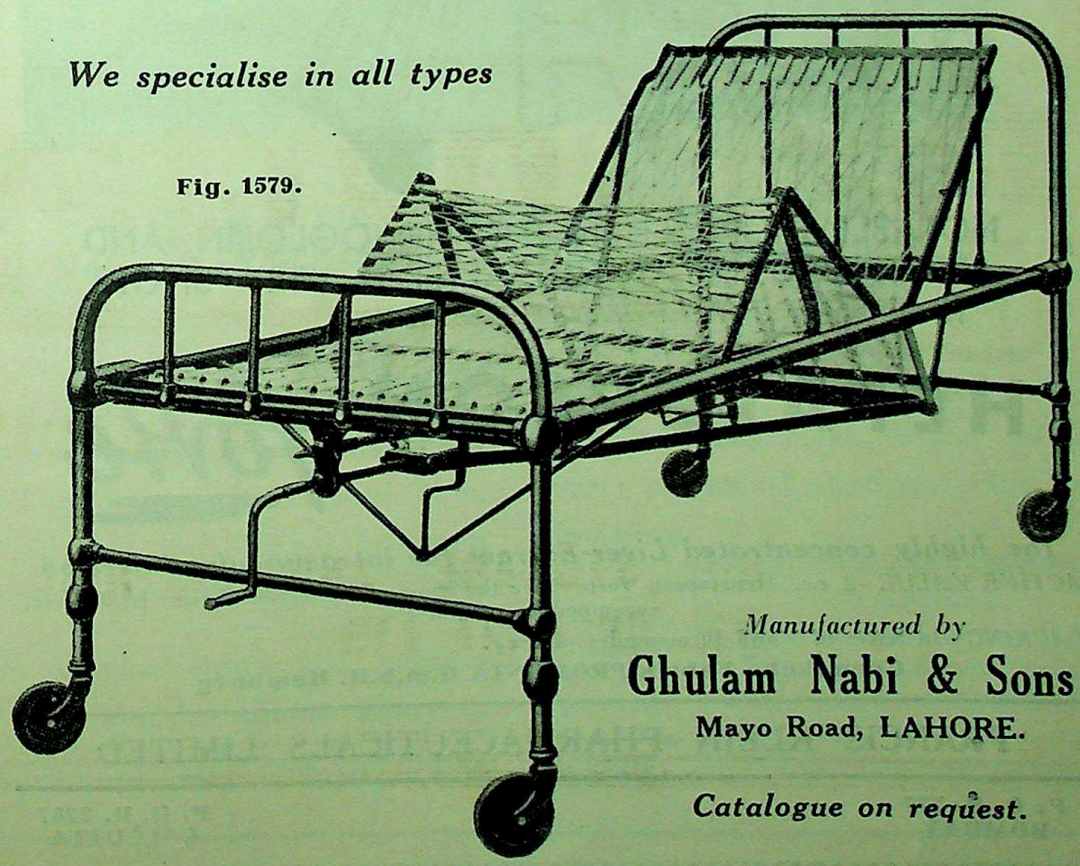

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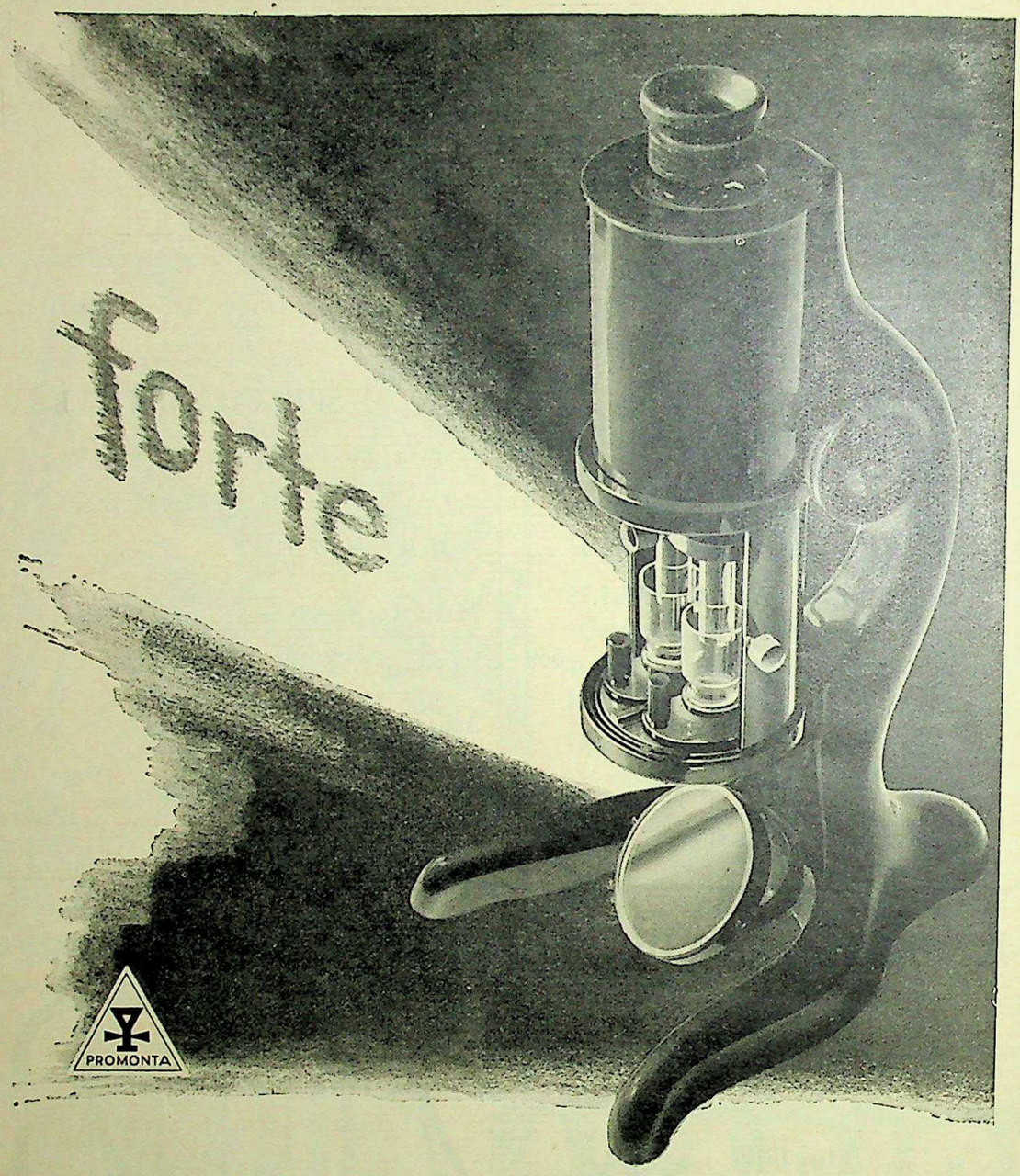

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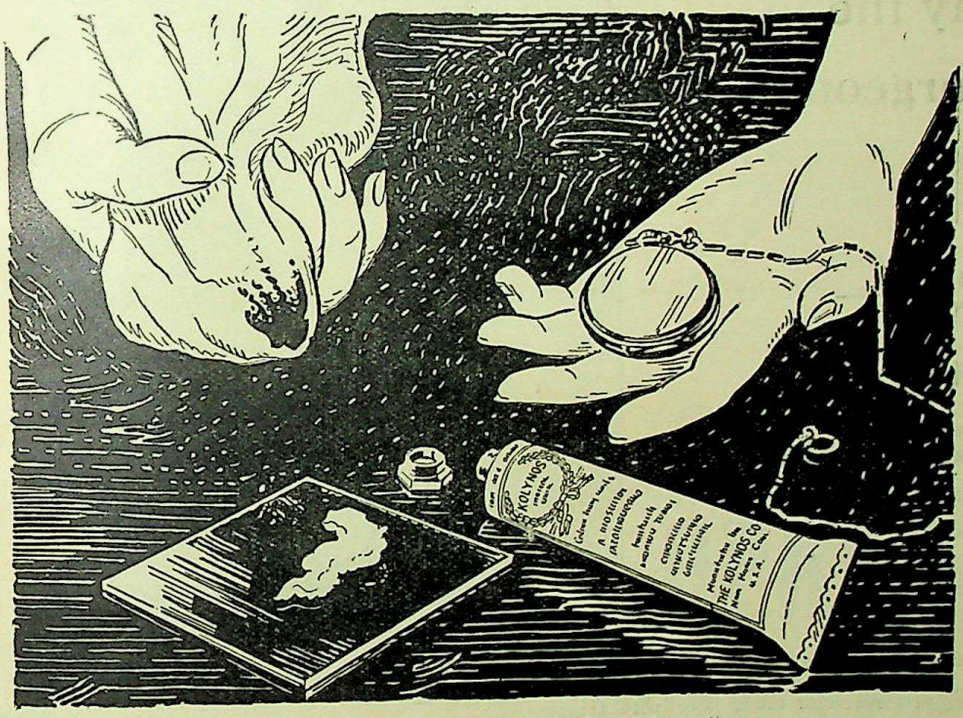

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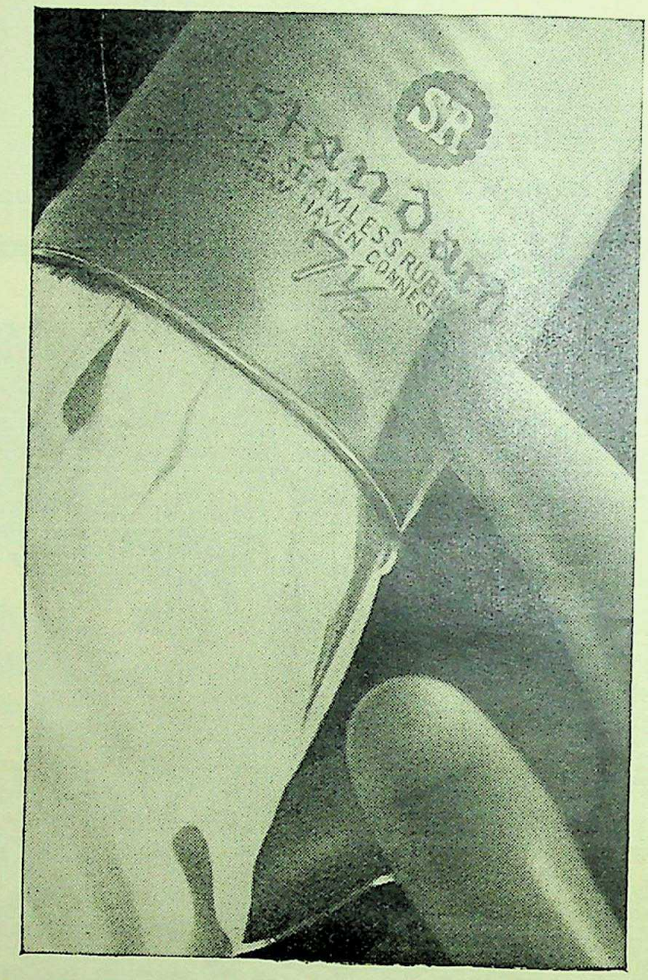

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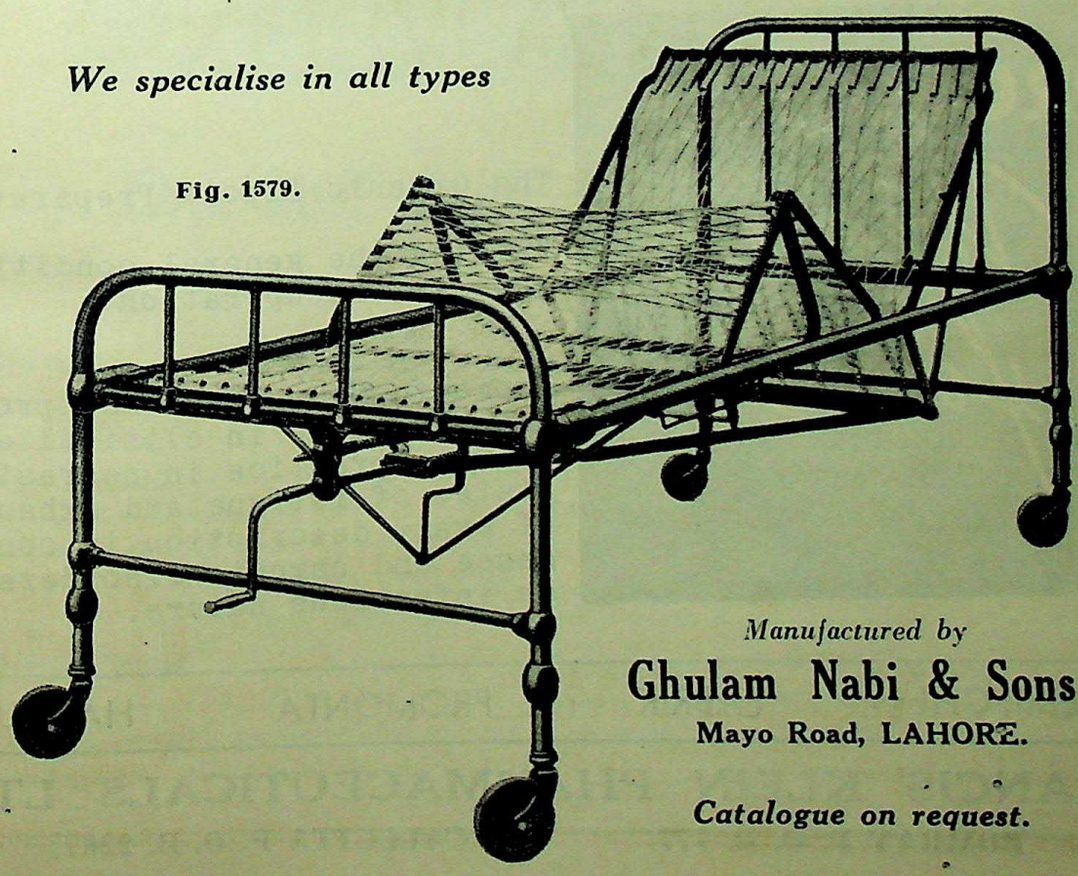

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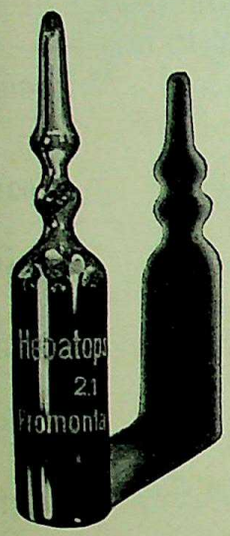

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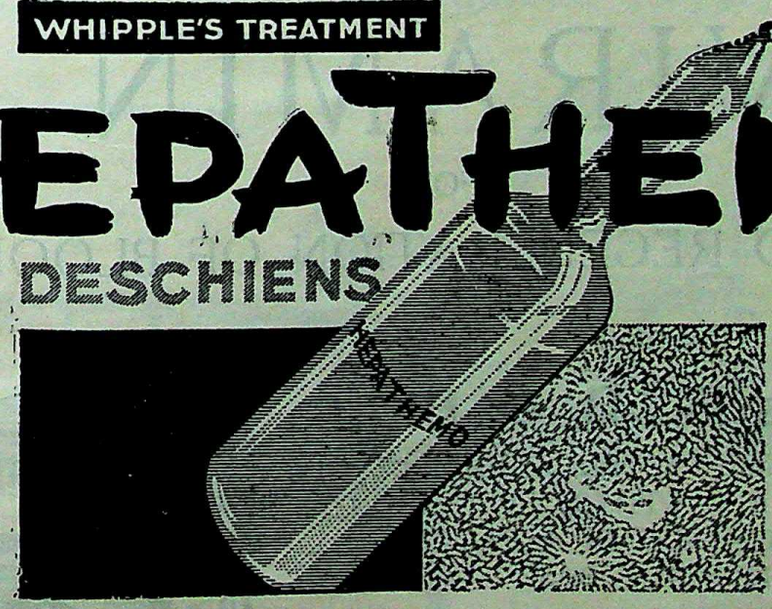

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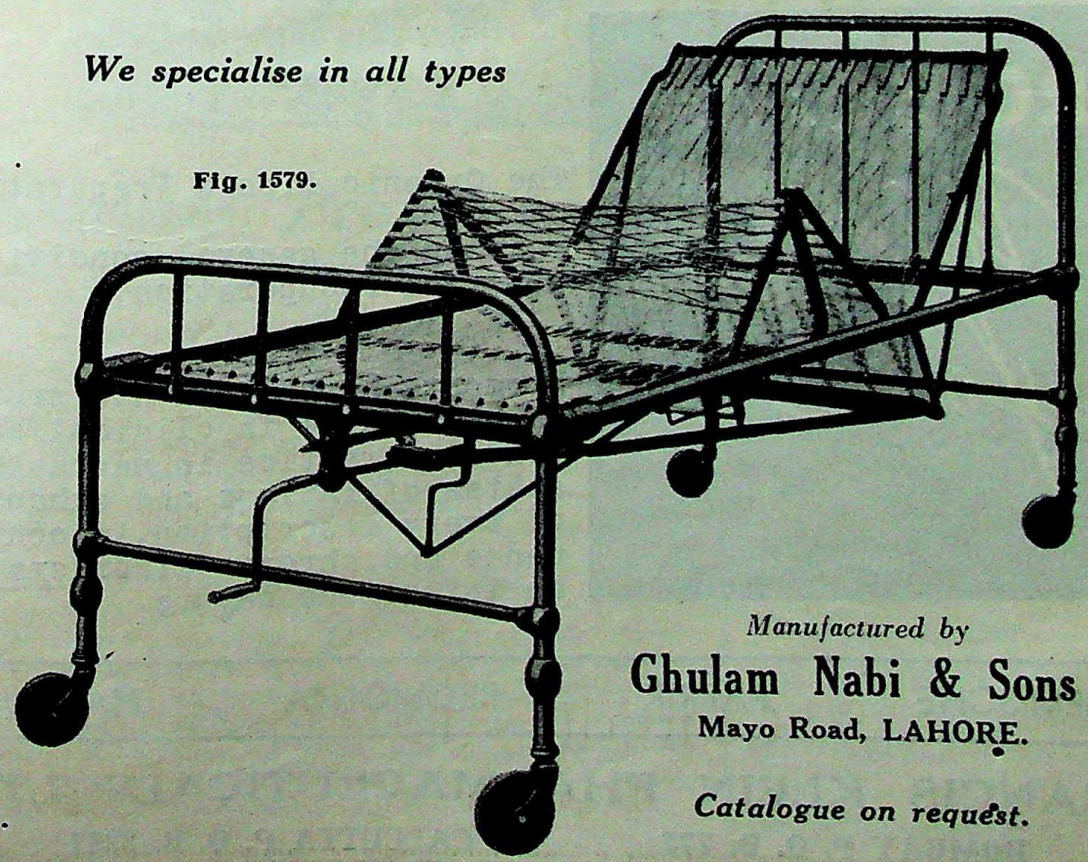

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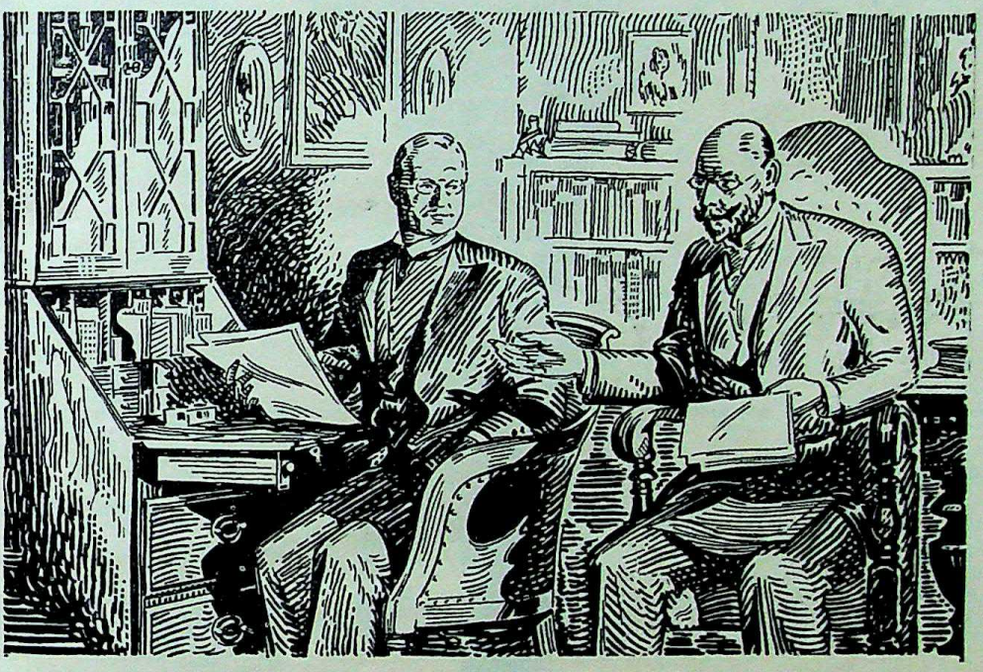

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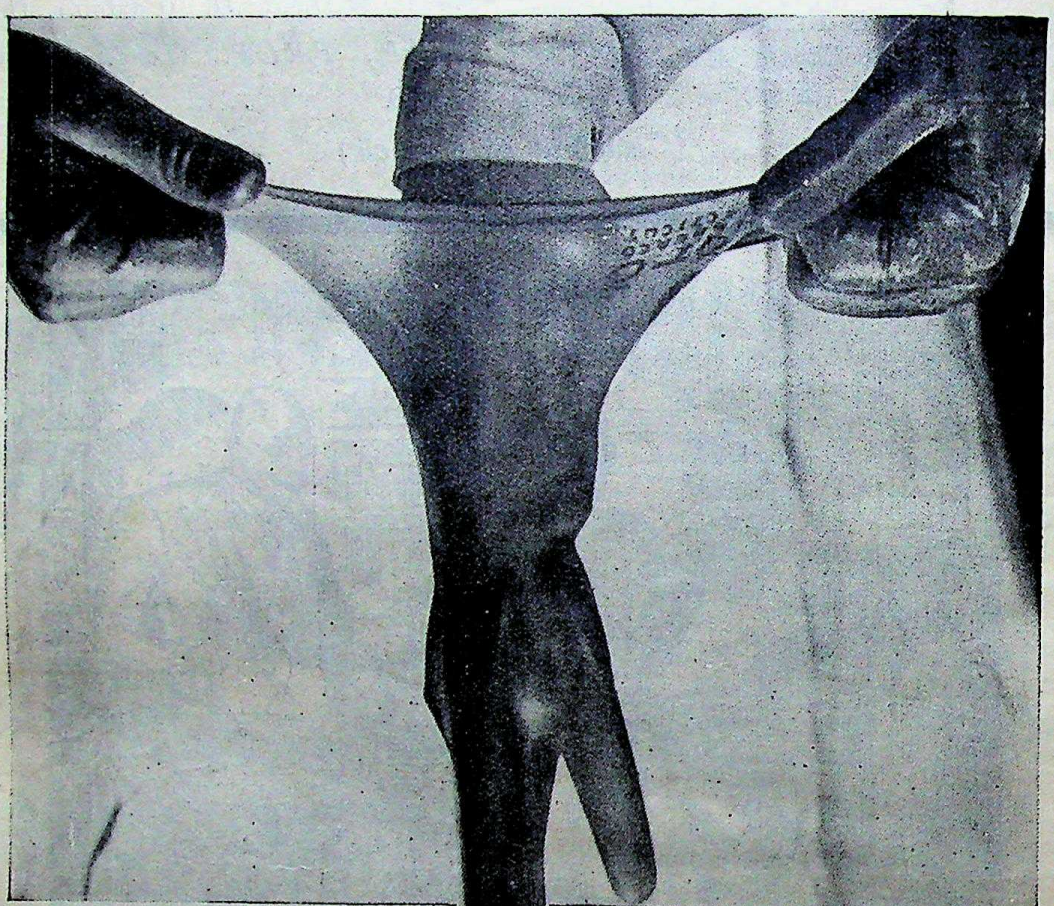

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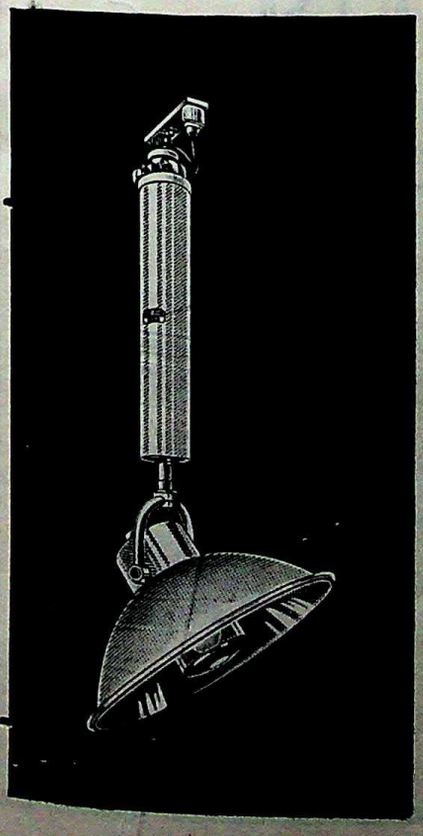

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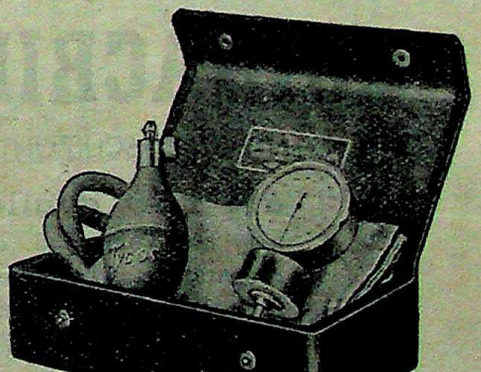

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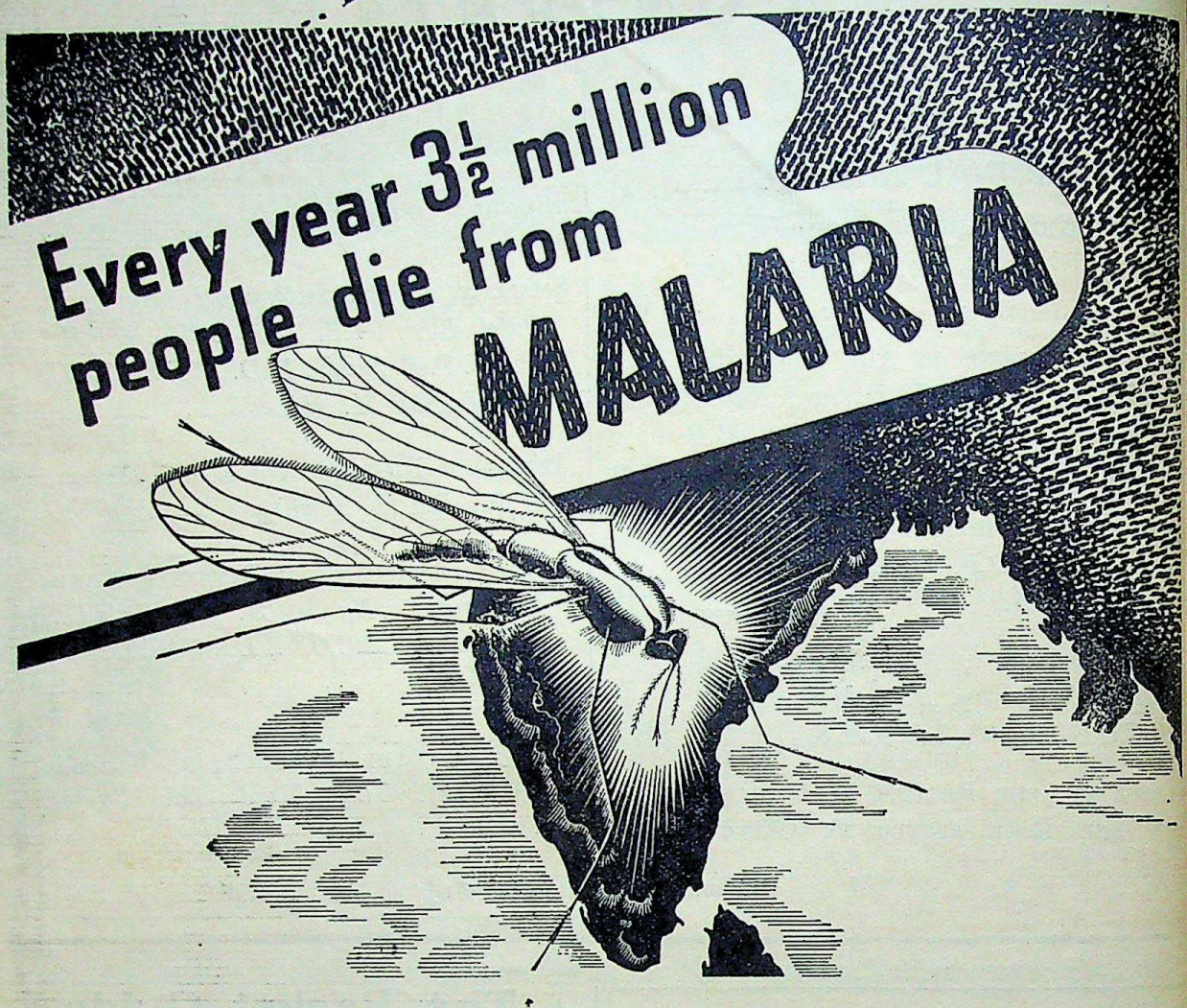

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Senior Surgeon with the Government of Mysore, *Bangalore.*
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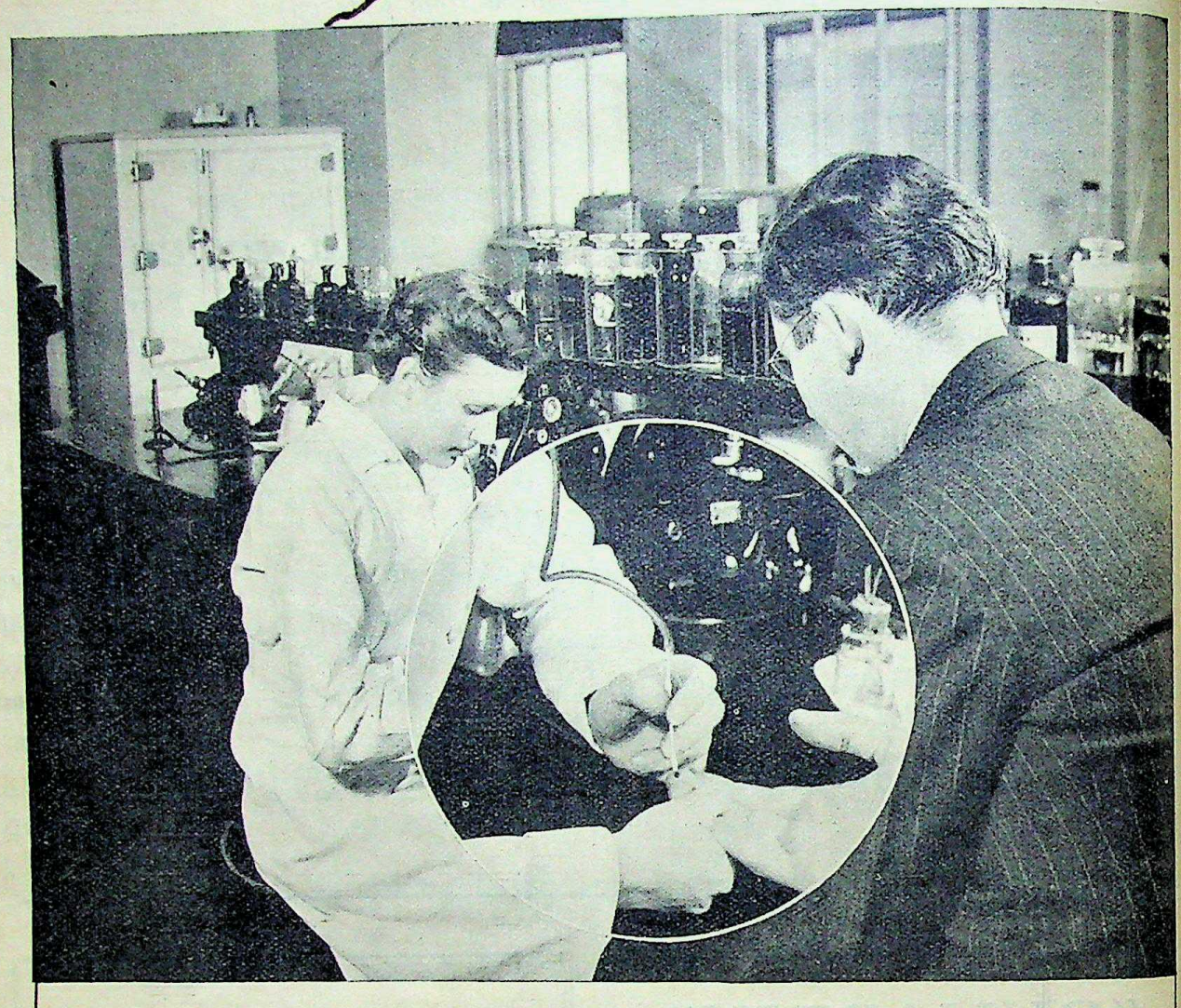

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Original Articles

STERNUM PUNCTURE

I. THE FINDINGS IN NORMAL INDIANS

By L. EVERARD NAPIER, M.R.C.P. (Lond.)
Professor of Tropical Medicine
and
P. C. SEN GUPTA, M.B. (Cal.)
Clinical Assistant
Calcutta School of Tropical Medicine

BONE puncture as an aid to accurate diagnosis of blood diseases and to the study of their ætiology has only come into general use during the last few years; the main reason for this was that the methods hitherto used for obtaining material from the bones were comparatively difficult, and usually painful unless an anæsthetic was used. The obvious advantages to be gained by studying the marrow during life led workers to turn their attention again to the subject of bone puncture and Young and Osgood (1935) devised a method of sternum puncture through the sterno-manubrial junction. The senior writer attempted to follow their technique, first practising on the cadaver, but found it difficult, and, with the non-rigid needles at his disposal, dangerous, as on one occasion —fortunately in the cadaver—the needle was deflected by the bone and pierced the mediastinum. However, whilst in London during the summer vacation of 1936 he was shown a simple method of sternum puncture by Professor Witts. Professor Witts used a special needle of a pattern which, we understand, was first introduced in Egypt. We found that with this needle sternum puncture presented no difficulties or risks, and caused no more pain than most patients expect to suffer during their treatment in hospital. We have therefore adopted this procedure as a routine in the investigation of anæmia and certain other diseases.

At this time the only available standards for sternum puncture in normal persons were those of Young and Osgood (*loc. cit.*), and of a few other workers quoted by them; some notes on normal findings in sternum puncture were received from Dr. C. R. Das Gupta who had made them from a clinical lecture given by Professor Witts.

It appeared to us that the first desiderata for a study of the cytology of bone marrow were a fixed nomenclature for the cells we encountered and a normal standard for comparison. Therefore in order to get a clear idea in our own minds regarding the identity of the various types of cell encountered, we had a number of coloured drawings made of each type, and we attempted to describe each as accurately as possible and to define the differentiating points. In the past we have found that European and American standards do not always coincide with Indian standards; we therefore thought it essential to carry out sternum-puncture counts in a certain number of normal individuals. Sternum puncture is not entirely painless and volunteers ready to subject themselves to the operation were not easily found. We obtained 10 such volunteers and, though the number is small, until we add to it, as we propose to do whenever opportunity arises, we were compelled to use the findings in these 10 cases as a basis for the calculation of a provisional standard.

In this report we shall confine ourselves to these observations made on normal individuals. In the plate we are publishing with this paper there are only one or two samples of each type of cell, stained by one method, but with subsequent papers we hope to include other plates in which we shall give further examples of normal cells, stained by other methods, as well as other cells not usually encountered in the bone marrow of the normal individual.

Technique of sternum puncture

Equipment.—The sternum puncture needle, 5 c.cm. and 2 c.cm. Record syringes, 2 per cent solution of novocaine, absolute alcohol, tincture of iodine, collodion and cotton-wool. The needle and the syringes are sterilized either by boiling or in an autoclave.

The sternum puncture needle

The needle used for sternum puncture is shown below (figure 1). It is made of rustless steel and the bore is about the same as that of a lumbar puncture needle. The guard C on the needle can be moved so as to adjust the depth of the puncture. Usually the guard has to be fixed at a distance of one quarter to half an inch from the tip, in order that the marrow may be reached. This distance will vary with the thickness of the skin and subcutaneous tissue of the thoracic wall, and it may be found advisable to readjust the guard after the needle has reached the periosteum, before it is pushed through the outer plate into the marrow cavity. The stylet A is kept in while the puncture is being made and is withdrawn after the cavity is reached.

Procedure

The skin over the sternum is cleaned thoroughly with alcohol. The best site for the puncture is just to one side of the middle line at the level of the third intercostal space. This area is first anæsthetized by infiltration with a two per cent solution of novocaine.

Some solution is first injected into the skin with a fine needle attached to a 2-c.cm. syringe, then the needle is pushed down to the periosteum and the rest of the solution injected. About 1 c.cm. is usually sufficient. After an interval of five minutes or so the actual puncture is made.

The needle is held with the knob of the stylet in the palm of the hand and the needle itself

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between the thumb and index finger, the latter on the guard C of the needle. Pressure is applied and the skin and subcutaneous tissues are pierced; a rotary movement will then facilitate puncture of the outer plate of the sternum. As the external plate of the sternum is pierced and the marrow cavity is entered, there is a sensation of loss of resistance, just as is felt on entering the spinal canal during lumbar puncture. The stylet is now taken out, the 5-c.cm. Record syringe is attached to the end of the needle, and the marrow blood is aspirated. When the fluid is aspirated the patient feels a dragging pain which is

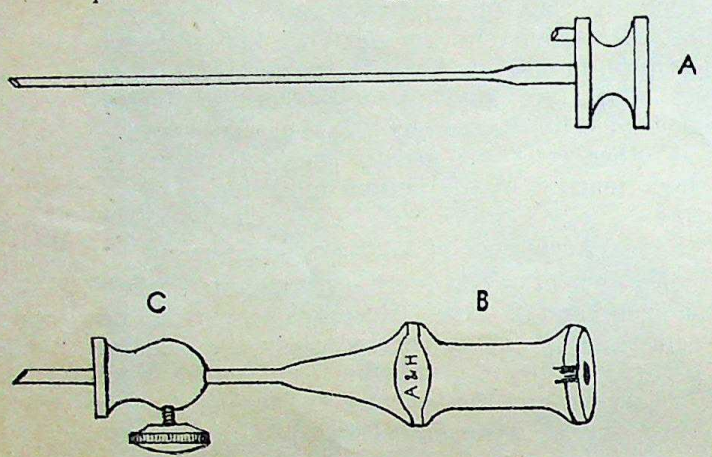

Fig. 1.—Needle B with stylet A removed: movable guard C (actual size).

a guide as to whether the needle is in the marrow cavity or not. As near as possible to 2 c.cm. of marrow (sinusoidal) blood is removed and the syringe and the sternum puncture needle are withdrawn; the puncture over the skin is sealed with collodion. The syringe is inverted several times so as to mix the contents thoroughly and then small drops are placed on clean slides and smears are made. The rest of the fluid is put into an oxalate tube*.

* Potassium oxalate is used to prevent coagulation. For 2 c.cm. of blood 4 milligrammes of potassium oxalate are used. A small measured volume of solution containing this amount of oxalate is put into the tube which is then dried in a hot-air sterilizer.

Not more than 2 c.cm. of blood is aspirated because, if more is drawn, there is a probability of causing negative pressure in the marrow cavity, of drawing in blood from the vessels in the locality and of diluting the sinusoidal blood; it is probably impossible to prevent this occurring entirely, therefore a constant amount of blood is drawn to obviate gross differences in the degree of dilution in the samples taken from different persons. The syringe is inverted several times in order that the contents may be mixed thoroughly. This is necessary because the fluid that comes out in the beginning is probably not the same as regards cellular content as the fluid that comes out towards the end of the aspiration.

Examination of material

The oxalated specimen was examined for:—
hæmoglobin content;
red cell enumeration;
reticulocyte percentage; and
nucleated cell enumeration.

The slides were stained by Leishman's stain and the proportions of the different nucleated cell elements were accurately estimated. (Other staining methods have also been used, but in this paper only Leishman-stained specimens are depicted and described.)

The criteria on which we identified the different cells are given below. The findings in the 10 'normal' male Indians are summarized in tables I and IA.

Description of individual cells

Megaloblast.—The earliest cell in the erythrocyte series.

Size—mean diameter—16μ to 21μ (mean of 25 cells = 18.1 $\pm$ 1.64μ).

(1) The cytoplasm is deeply basophilic (greyish-blue colour).

(2) The nucleus is large, round or oval, occupies most of the cell, and is usually somewhat eccentrically placed. The chromatin network is fine and delicate and a fine granular effect is produced; nucleoli may sometimes be seen.

Erythroblast

Size—mean diameter—12μ to 18μ (mean of 25 cells = 14.38 $\pm$ 1.67μ), that is, slightly smaller

Tables I and IA giving a summary of the hæmatological findings in the sinusoidal blood from the sternum of 10 normal male Indians

TABLE I

	Range	Mean	Standard deviation
Hæmoglobin in grammes per 100 c.c.	12.1 to 14.85	13.43	± 0.93
Red cells per c.mm. in millions	4.40 to 5.45	4.99	± 0.40
Reticulocytes—percentage of red cells	0.3 to 1.6	0.75	± 0.39
Total nucleated cells per c.mm.	32,500 to 116,000	53,500	± 26,500
Nucleated red cells—number per c.mm.	6,987 to 27,260	13,824	± 6,420
Nucleated red cells—percentage of total nucleated cells	20 to 31.5	25.75	± 4.07
Leucocytes—percentage of total nucleated cells ..	68.5 to 80.0	74.25	± 4.07
Granulocytes—percentage of total nucleated cells ..	56.5 to 70.8	64.40	± 5.10
Non-granular leucocytes—percentage of total leucocytes	7.0 to 14.0	9.82	± 2.43
Leucocyte/erythroblast ratio	2.17 to 4.00	2.97	± 0.67

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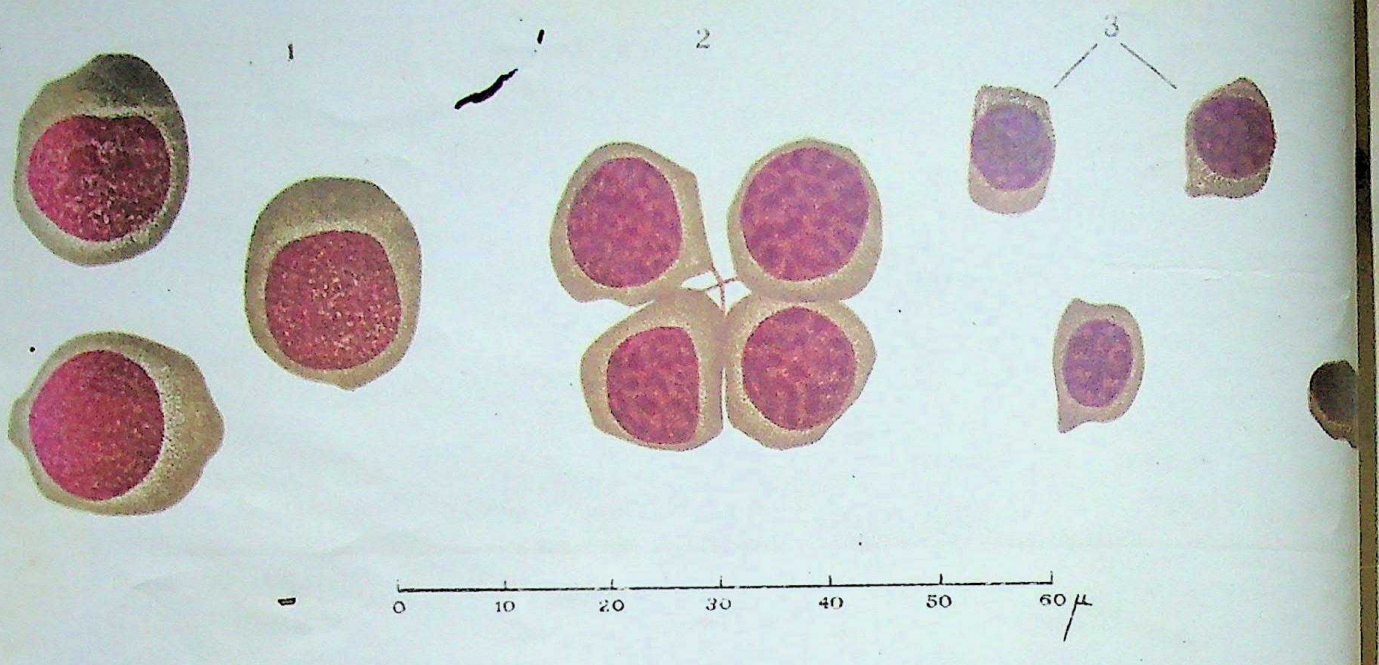

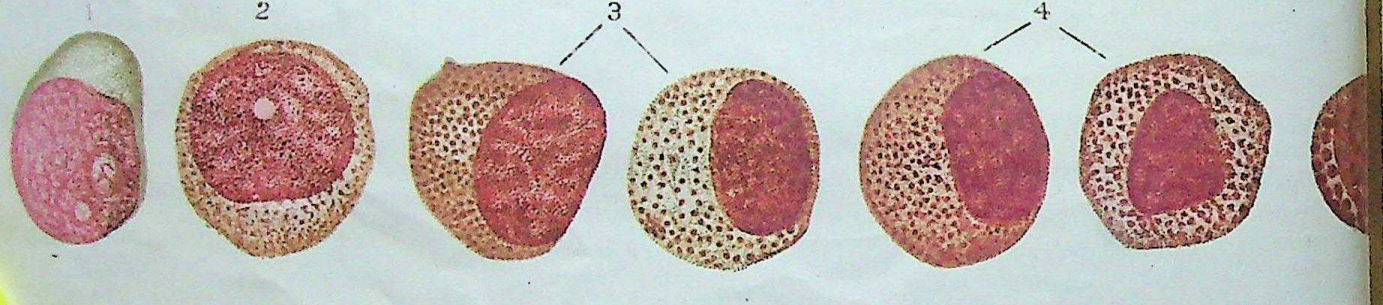

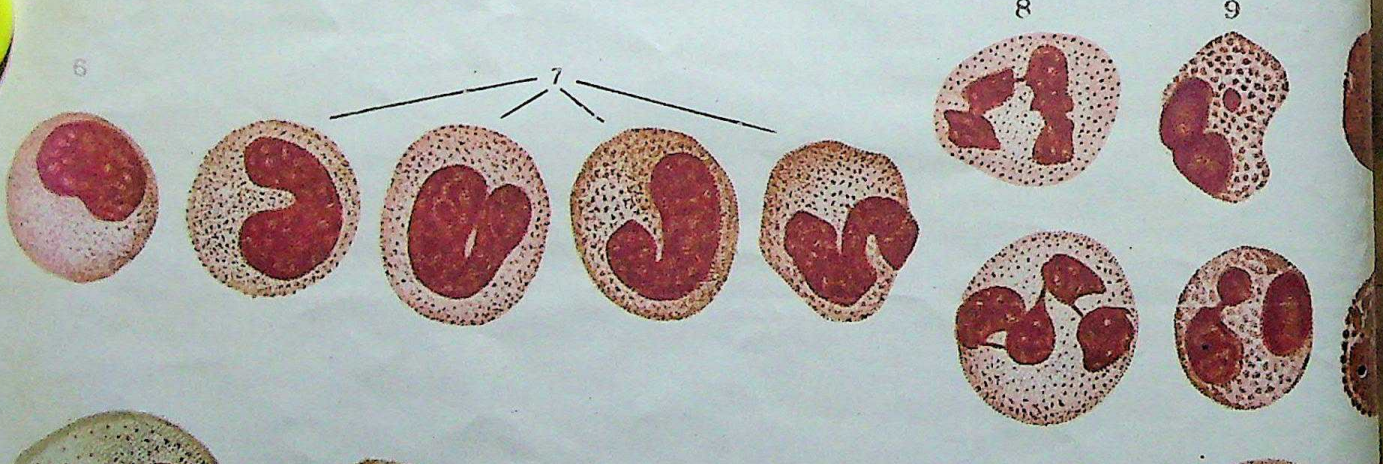

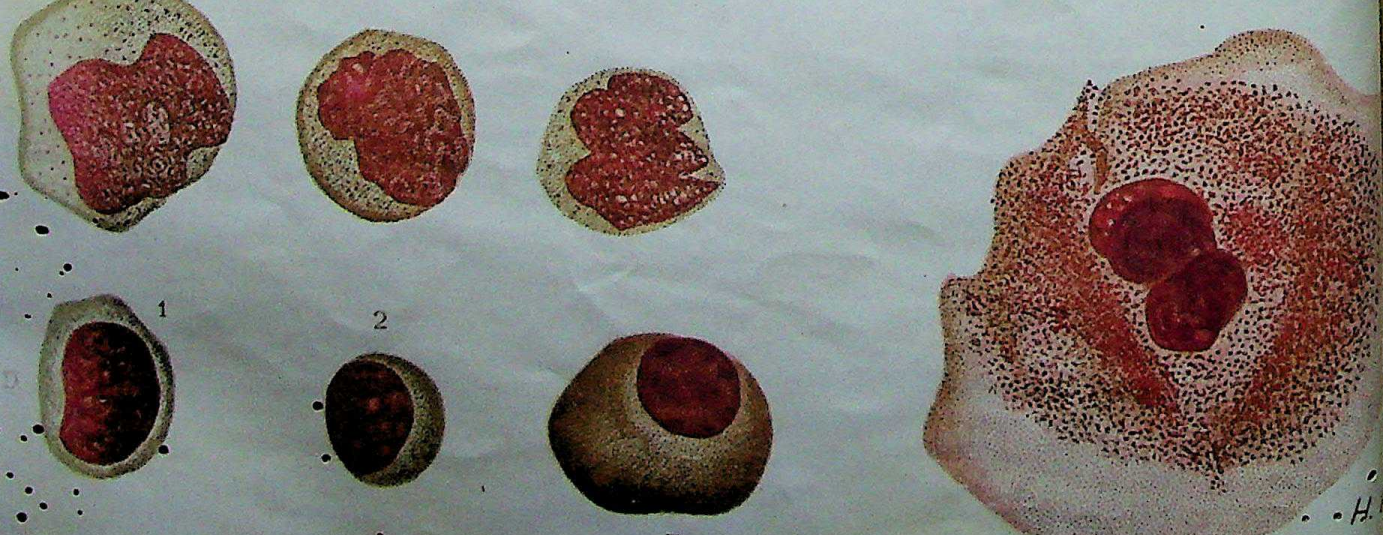

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TABLE IA

		Percentum of nucleated cells	
		Range	Mean
Nucleated red cells.	Megaloblasts	0 to 1.5	0.7
	Erythroblasts	0.4 to 10.0	3.4
	Normoblasts	16.0 to 25.5	21.6
	Myeloblasts	0.4 to 1.5	1.2
	Premyelocytes	0 to 1.5	0.7
	Myelocytes—		
	Neutrophil	1 to 9.5	4.4
	Eosinophil	0.4 to 2.0	1.3
	Basophil	None observed	

PLATE I: AN EXPLANATION

In the representation of colour each artist will render his own interpretation which will differ, however slightly, from that of other artists.

In the making of a coloured plate of blood cells there are three separate artists concerned, the one who makes the original painting, the lithographer, and the printer.

Thus, each deviation from the original is liable not only to perpetuation but to a threefold exaggeration and it is almost impossible to ensure that the final result is an exact representation of the original.

In this case, the work has been done excellently and the plate is a better representation of the actual cells, as seen in the microscope, than are the plates in many textbooks and atlases of hæmatology: nevertheless, we think that the following comments may assist our readers:—

The cytoplasm in the premyelocyte (B2) is too pink: there should be more blue in it; and one nucleolus in the nucleus is a little too prominent.

In the first large mononuclear cell (C) the reddish-purple dots in the cytoplasm are far too large and prominent. In the second cell these are depicted more correctly.

The cytoplasm in the plasma cell (E) is too grey.

The cytoplasm in the megakaryocyte is too pink; there should be more light blue in this.

Size—mean diameter—5.5μ to 13.5μ (mean of 25 cells = 9.48μ).

(1) The cytoplasm contains hæmoglobin; the colour varies from a light grey to the light dull red of the normal red cell.

(2) The nucleus may be similar to that of the erythroblast, only smaller and more darkly stained, or in older normoblasts it is very dense, stains quite black like an ink drop, and appears to stand out from the cytoplasm; this form varies in size from a full-sized nucleus occupying about half the cell down to a small round dot. It may take either a clover-leaf or a rosette form just before it is extruded. It is usually eccentrically placed.

Myeloblast

The stem cell of the myeloid series of leucocytes.

Size—mean diameter—14.5μ to 19.5μ (mean of 25 cells = 16.58 $\pm$ 1.26μ).

Nucleoli may or may not be present.

DESCRIPTION OF PLATE I

A. *Red cell series.*
1. Megaloblasts.
2. Erythroblasts.
3. Young normoblasts.
4. More mature normoblasts, with pyknotic nucleus and hæmoglobinized cytoplasm.

B. *Myeloid series.*
1. Myeloblast.
2. Premyelocyte.
3. Neutrophil myelocytes.
4. Eosinophil myelocytes.
5. Basophil myelocyte.
6. Granulocyte, neutrophil, young form.
7. " " band forms.
8. " " segmented forms.
9. " eosinophil.
10. " basophil.

C. Large mononuclears.

D. Lymphocytes.
1. Large.
2. Small.

E. Plasma cell.

F. Megakaryocyte.

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TABLE IA

		Percentum of nucleated cells	
		Range	Mean
Nucleated red cells.	Megaloblasts	0 to 1.5	0.7
	Erythroblasts	0.4 to 10.0	3.4
	Normoblasts	16.0 to 25.5	21.6
Granular leucocytes.	Myeloblasts	0.4 to 1.5	1.2
	Premyelocytes	0 to 1.5	0.7
	Myelocytes—		
	Neutrophil	1 to 9.5	4.4
	Eosinophil	0.4 to 2.0	1.3
	Basophil	None observed	
	Mature granulocytes—		
	Young forms	6.4 to 15	9.7
	Band forms	14.0 to 38.5	25.3
	Segmented neutrophil	6.5 to 25.6	16.8
	Eosinophil	0 to 7.6	4.7
	Basophil	0 to 1	0.2
	Ratio: immature/mature	0.066 to 0.235	0.138
Non-granular leucocytes.	Lymphocytes	3 to 12	6.25
	Large mononuclears	1.2 to 7	3.0
	Plasma cells	0 to 1.6	0.6

than the megaloblast. Often seen in pairs connected by a small strand or filament of cytoplasm.

(1) The cytoplasm is deeply basophilic, usually rather a brighter blue than that of the megaloblast.

(2) The nucleus occupies a slightly greater proportion of the cell, but as the whole cell is smaller, it is usually slightly smaller than that of the megaloblast; also the chromatin is much denser and coarser and gives a mottled effect, or there may be a cartwheel-like arrangement of the chromatin.

Normoblast

Size—mean diameter—5.5μ to 13.5μ (mean of 25 cells = 9.48μ).

(1) The cytoplasm contains hæmoglobin; the colour varies from a light grey to the light dull red of the normal red cell.

(2) The nucleus may be similar to that of the erythroblast, only smaller and more darkly stained, or in older normoblasts it is very dense, stains quite black like an ink drop, and appears to stand out from the cytoplasm; this form varies in size from a full-sized nucleus occupying about half the cell down to a small round dot. It may take either a clover-leaf or a rosette form just before it is extruded. It is usually eccentrically placed.

Myeloblast

The stem cell of the myeloid series of leucocytes.

Size—mean diameter—14.5μ to 19.5μ (mean of 25 cells = 16.58 $\pm$ 1.26μ).

(1) The cytoplasm is pale blue, without any granules.

(2) The nucleus is more-or-less rounded and very finely meshed. It stains a faint purple colour and does not become denser at the edges (*i.e.*, there is no nuclear membrane). There are usually 3 or 4 nucleoli.

Premyelocyte

Size—almost the same as that of the myeloblast. Mean diameter 14.5μ to 20μ (mean of 25 cells = 16.9 $\pm$ 1.55μ).

The cytoplasm and the nucleus are very similar to those of the myeloblast, but the former contains fine reddish-blue granules. Nucleoli may or may not be present.

DESCRIPTION OF PLATE I

A. *Red cell series.*
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1. Myeloblast.
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6. Granulocyte, neutrophil, young form.
7. " " band forms.
8. " " segmented forms.
9. " eosinophil.
10. " basophil.

C. Large mononuclears.

D. Lymphocytes.
1. Large.
2. Small.

E. Plasma cell.

F. Megakaryocyte.

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Myelocyte

Size—mean diameter—14.5μ to 19μ (mean of 25 cells = 16.72 ± 0.93μ).

(1) The cytoplasm is a pale greyish-blue and contains the characteristic granules, which are either neutrophilic, eosinophilic, or basophilic. According to the staining character of the granules these are called neutrophilic, eosinophilic, or basophilic myelocytes and they give rise to the neutrophil, eosinophil, or basophil polymorphonuclear leucocytes (granulocytes) found normally in the blood.

(2) The nucleus is oval or rounded, slightly coarser than those of its genetic predecessors, and purple staining.

band, which may be folded and take various shapes, *e.g.*, L-, C-, S-, or Z-shaped, or may be coiled. There is no division of nucleus at this stage.

	Sizes			
	Range		Mean of 25 cells and standard deviation	
Young	12μ	to 19.5μ	15.18	± 2.12
Band	11.5μ	to 17μ	13.32	± 1.33
Segmented	11.5μ	to 14.5μ	13.18	± 0.83
Eosinophil	12μ	to 17.5μ	14.78	± 1.55
Basophil	10μ	to 14.5μ	12.04*	± 1.26

* Mean of 13 cells only.

Large mononuclear leucocyte

Size—mean diameter—13μ to 21μ (mean of 25 cells = 16.78 ± 1.98μ).

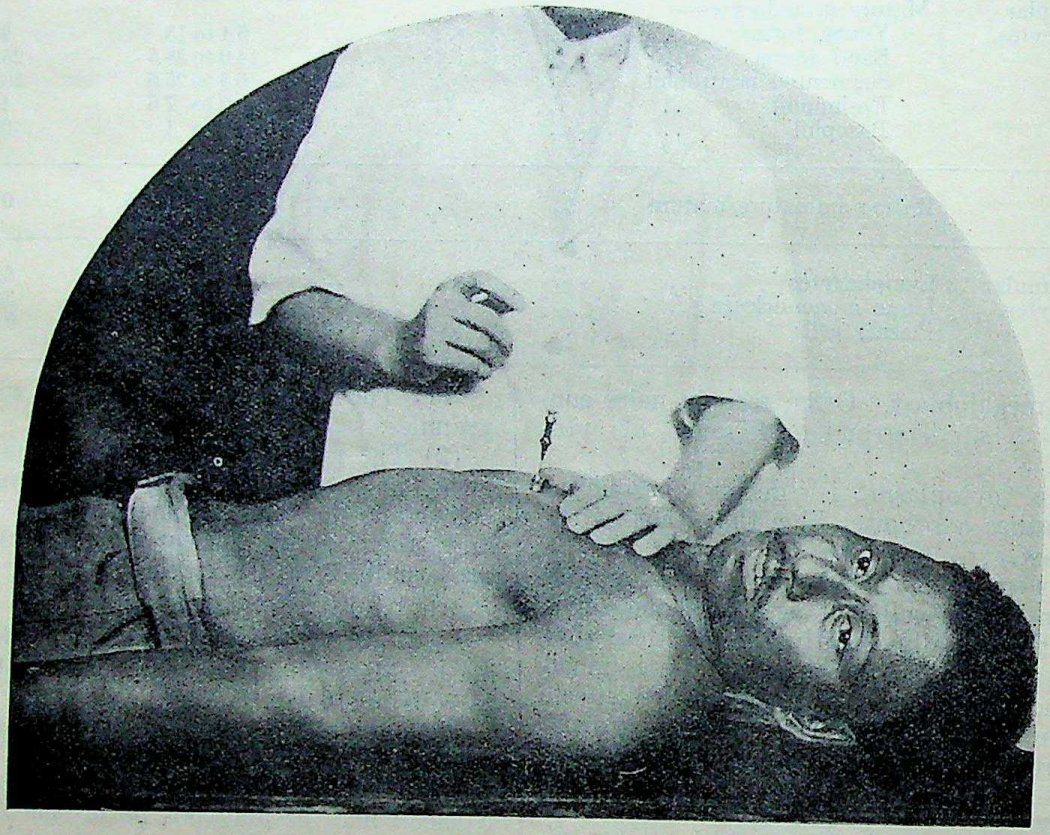

Fig. 2.—Needle in position after the marrow cavity has been penetrated.

Granulocytes

The mature myeloid leucocyte.

These are divided into three classes, neutrophils, eosinophils, and basophils, according to the staining properties of the granules contained in the cytoplasm. In the neutrophils the cytoplasm is oxyphilic and contains fine granules. In the eosinophils and basophils the granules are coarse. The nucleus of the fully-mature cell is divided into two or more segments (*segmented forms*). Between the precursor cell (the myelocyte) and the fully-mature segmented forms, there are intermediate forms, the *young* and the *band forms*. The *young granulocyte* has a nucleus which is kidney-shaped or slightly indented on one side. In the *band form* of granulocytes, the nucleus is like a ribbon or

(1) The cytoplasm stains a pale dull blue and shows very fine reddish-blue granules. It may contain vacuoles.

(2) The nucleus is reniform, horse-shoe-shaped, or even convoluted in the mature cells, and in the younger cells it is oval or even rounded. It is eccentrically placed and stains a pale violet colour. It shows a characteristic strand arrangement of chromatin, and, where the strands of chromatin cross, the staining appears darker.

Lymphocytes

Size—mean diameter—

large lymphocyte—12μ to 15μ.

small lymphocyte—7μ to 12μ (mean of 25 cells = 10.6 ± 1.28μ.)

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(1) The cytoplasm is clear sky-blue and in the small (mature) lymphocyte it is like a thin rim round the nucleus. In the larger forms it is more plentiful and may occasionally contain a few fine reddish-blue granules.

(2) The nucleus stains deeply and is usually composed of heavy masses of chromatin, particularly towards the periphery, whilst between these masses may be seen paler-staining areas. The nucleus occupies most of the cell, leaving a comparatively narrow band of cytoplasm.

This cell is distinguished from the large mononuclear by the clear blue cytoplasm, without, or with few, fine granules and by the darker staining of the nucleus.

a large lobulated deeply-stained nucleus without nucleoli.

Discussion

The material which is obtained by this procedure is neither peripheral blood (obviously) nor bone marrow, but is blood from both the patent and the closed sinusoidal spaces in the hæmopoietic tissue of the bone marrow, in which are mixed a few cells detached from the walls of these sinuses by the intruding needle, or by the act of aspiration. The extent to which the detached tissue cells are added to the sinusoidal blood probably varies with each puncture and constitutes the weakness of the procedure from the point of view of obtaining a true and unvarying picture of bone marrow

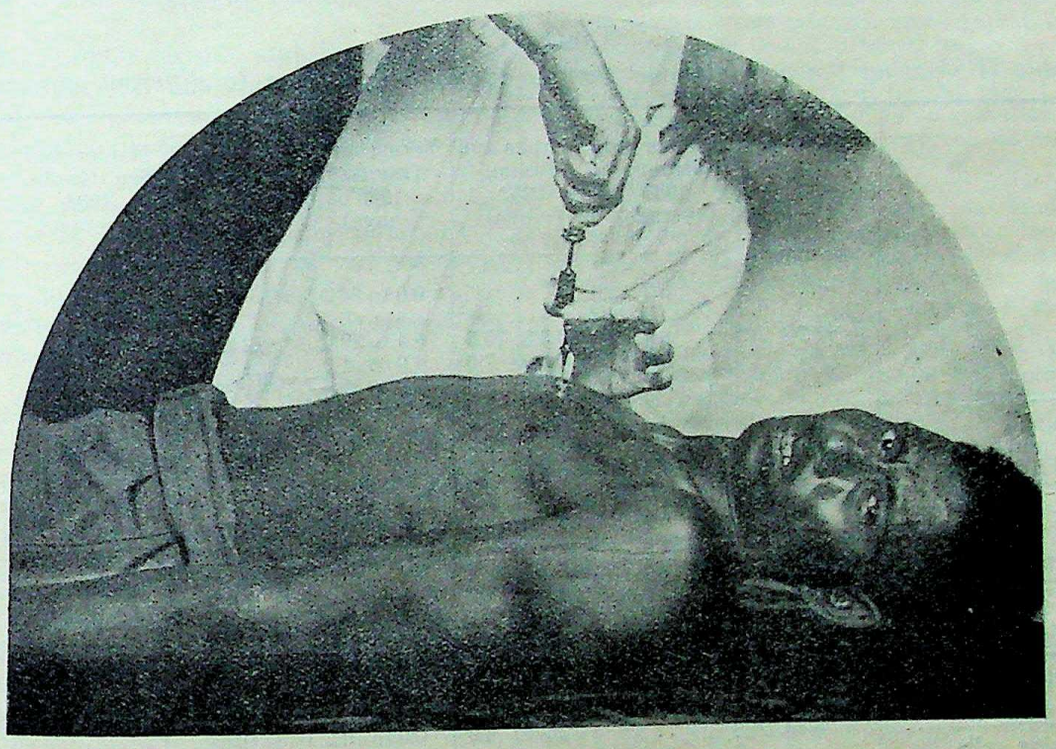

Fig. 3.—The stylet has been removed and sinusoidal blood is being drawn into a Record syringe.

Plasma cell

Size—mean diameter—14μ to 18μ (mean diameter of 25 cells = 15.5 $\pm$ 1.14μ).

The cell is usually oval.

(1) The cytoplasm is very plentiful, a dull rather dark blue, occasionally with reddish-blue granules.

(2) the nucleus is dark staining, usually with a distinct cart-wheel pattern, eccentric, with a diameter less than half that of the whole cell.

Megakaryocyte

Size—a huge cell, 32μ to 53μ, mean 45μ. Very amœboid with irregular-shaped cytoplasm which takes the stain badly becoming a washed-out pink colour with fine granules, giving it a frosted-glass effect, around the nucleus, but often with the peripheral portion of the cytoplasm clear, and its edge ill-defined: it has

hæmopoietic activity. However, the extreme variations in a single subject that have been reported by some workers, and the differences in the normals given by different workers can probably to some extent be accounted for by variations or defects in the technique employed, *e.g.*, by the failure to remove a small and constant amount of blood, by failure to mix the blood before making smears, or by making counts from one part of the blood film only.

Zanaty (1937) has pointed out that wide variations may exist in the total nucleated-cell counts and that little idea can be obtained from these counts of the activity of the bone marrow: this is probably true. Our normal series was a very small one and possibly for that reason we did not get the extreme figures that he quotes, but from our experience of sternum puncture in diseased conditions we believe that the correlation between hæmopoietic activity and the total

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nucleated-cell count is more complete than this writer suggests.

The hæmoglobin was fairly constant, between 1 gramme and 1.5 gramme less than that of the venous blood in the same individual; similarly the red cell count in the sinusoidal blood was about half a million less than in the venous.

The reticulocyte percentage was a matter of surprise to us; it was in every instance within the normal range of that in the peripheral blood and the mean of the whole series was only a small fraction above the peripheral-blood mean. This is, however, the same order of finding as that of other workers, with the exception of Young and Osgood (*loc. cit.*) who give a higher range (*see* table II).

been confirmed by many other workers in India and in Europe.

Megakaryocytes did not appear in our counts though we have seen them in the sinusoidal blood of apparently normal individuals. Nor in this series did we identify any cells as monoblasts or lymphoblasts. We did not include in our counts cell fragments or 'disintegrating cells'; we identified to our own satisfaction practically all the nucleated cells that we saw, and we do not believe that more than a fraction of a per cent of 'disintegrating cells' or fragmented nuclei that we omitted to identify will have been included in our total nucleated-cell counts.

Our immature/mature myeloid cell ratio was apparently about the same as that of Young

TABLE II

*Table II showing the normal bone marrow cytology according to different observers**

	Arinkin, 1929 (average)	Holmes and Broun, 1933 (average)	Tempka and Braun, 1932 (range)	Young and Osgood, 1935 (range)	Segerdahl, 1935	Napier and Sen Gupta, 1938 (average)	Schilling and Benzlar, 1915
Megaloblast ..	..	5.2	..	0.0 to 4.2	..	0.7	..
Erythroblast + normoblast.	12.7	6.9	13.3 to 16.6	5.4 to 20.0	12.88	25.0	37.47
Myeloblast ..	1.7	2.4	4.6 to 7.0	0.0 to 1.2	1.32	1.2	..
Premyelocyte ..	1.9	..	3.7 to 6.8	0.0 to 7.8	1.35	0.7	..
Myelocyte—							
Neutrophil ..	6.55	7.0	12.7 to 13.3	0.0 to 2.6	15.0	4.4	17.39
Eosinophil ..	0.65	..	1.5 to 2.7	0.0 to 0.4	1.37	1.3	..
Basophil ..	*Nil*	..	0.0 to 0.3	*Nil*	..	..	..
Neutrophil—							
Young ..	2.4	6.7	14.3 to 16.2	1.8 to 9.8	15.69	9.7	18.98
Band ..	..	14.0	17.0 to 22.5	15.8 to 33.0	10.48	25.3	0.11
Segment ..	48.0	17.4	16.2 to 20.3	7.4 to 25.2	20.86	16.8	4.85
Eosinophil ..	2.31	1.0	1.5 to 7.2	0.0 to 4.6	1.44	4.7	2.91
Basophil ..	0.35	0.3	0.2 to 0.7	0.0 to 0.8	0.14	0.2	..
Lymphocyte ..	11.9	24.9	2.6 to 3.3	4.8 to 16.0	16.76	6.25	..
Large mononuclear ..	5.7	9.0	0.5 to 0.8	0.0 to 4.2	2.27	3.0	18.96
Plasma cell ..	0.6	..	0.3 to 1.6	0.0 to 1.0	0.39	0.6	Not recognized.
Megakaryocyte ..	3.35	..	2.2 to 4.0	0.0 to 0.2	0.029	..	
Disintegrating cells ..	..	..	..	12.8 to 31.8	0.031 reticular cell.	..	
Reticulocyte (per cent of red cells).	0.8 to 1.4	..	0.8	1.2 to 5.2	..	0.75	
Myeloid—							
Erythroblast ratio	7.7 : 1 to 4.17 : 1	4.86 : 1	5.83 : 1 to 5.39 : 1	8.29 : 1 to 2.00 : 1	..	2.97 : 1	

*This table is composed from the tables given by Young and Osgood (1935), and by Zanaty (1937). Some rearrangement, to correlate the two tables and to bring them into line with our own nomenclature, has had to be made. The figures have not been checked from the original publications.

Our myeloid/erythroblast ratio is however lower than that of any other workers, though all our findings were within the range given by Young and Osgood.

The megaloblast is a continual subject of controversy and many writers claim that it is not found in the normal bone marrow: we can only say that in most of our 'normal' smears, we found cells that were indistinguishable from the megaloblasts with which we are quite familiar in sinusoidal-blood smears from cases of anæmia and whose identity as megaloblasts has been confirmed by many other workers in India and in Europe.

Megakaryocytes did not appear in our counts though we have seen them in the sinusoidal blood of apparently normal individuals. Nor in this series did we identify any cells as monoblasts or lymphoblasts. We did not include in our counts cell fragments or 'disintegrating cells'; we identified to our own satisfaction practically all the nucleated cells that we saw, and we do not believe that more than a fraction of a per cent of 'disintegrating cells' or fragmented nuclei that we omitted to identify will have been included in our total nucleated-cell counts.

Our immature/mature myeloid cell ratio was apparently about the same as that of Young and Osgood, but was lower than that of other observers.

Summary

The technique of sternum puncture is described.

The various cells found in the normal sinusoidal blood of Indians are described and depicted in a coloured plate.

Tables showing the range and mean number of each different type of cell in the normal

(*Continued at foot of opposite page*)

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ADULT FILARIAL WORM OF UNKNOWN SPECIES REMOVED FROM THE SKIN OF A HUMAN SUBJECT

By H. R. RISHWORTH, F.R.C.S.

District Medical Officer, G. I. P. Ry.

Late Honorary Surgeon, St. George's Hospital, Bombay

ADULT filarial worms have occasionally been recorded from the human eye in India, but the removal of a living and intact specimen from the subcutaneous tissue of a living subject has so far not been recorded in this country. A remarkable feature of the case here noted is the removal of specimens both from the eye and the skin of the same patient. The skin specimen is in a good state of preservation and from its morphology would appear to belong to a new species.

Sunder Rao (1933) records and illustrates two worms under the left conjunctiva of a Jewess who had suffered from elephantiasis for four years. An attempt to obtain the worms for examination failed, one disappearing into the tissues during section and the other being lost in the process of extraction in some unaccountable manner. Several members of the patient's family were infected with *Wuchereria bancrofti* and the presumption is that these worms were adult *W. bancrofti*.

Charles (1920) reported the removal of a living adult filaria from the eye of an adult male, the specimen being later identified by Sewell as *Filaria conjunctivæ* Addario, 1885.

Das Gupta (1921) reported the removal at Ramporehaut of two live worms from a cyst in the outer canthus of a Mohammedan. These worms have not been identified.

Wright, Seetharama Iyer and Pandit (1935) described an adult male filaria from the anterior chamber of the eye of a man in Madras.

Loa loa occurs in West Africa in the Congo basin and is said to be common in connective tissue under the skin and in the eye. In the skin the worms produce Calabar swellings. *Onchocerca volvulus* is found in West Africa and South America and produces nodules in the skin with xeroderma, a form of lichenoid dermatitis associated with intense pruritus. The other known species of Filaroidea do not apparently appear in the skin or subcutaneous tissues in the adult stage. A small nodule with erythema and a mild degree of itching comparable to some extent with Calabar swelling and pruritus were associated with the presence of the worm in this case.

Mrs. H——, European, age 45, came to me at 9 p.m. one night early in September, saying that she felt a worm moving under the skin of her neck. She had an irregular erythematous patch on the right side of her neck at the level of the thyroid cartilage about one and a half inches square. Close examination revealed a pale vermiform streak 1 mm. wide and 25 to 30 mm. long coiled in wide sweeps roughly in the shape of the figure 2 with smaller irregularities in the main curves. An advancing slightly knobbed end could be seen moving at a slow rate, sometimes retracting but generally going forward. The rate of movement was about two to three millimetres a minute. I observed it for about 20 minutes during which time the coils formed roughly the figure 3. When first seen the whole of the apparent portion was about 25 mm. in length and seemed to be just under the epidermis. In fact it struck me it was so superficial that a good blister might expose the whole worm. I did not attempt to remove the worm that night for several reasons. It lay over a comparatively extensive area in a lady's neck and seemed so fragile that it occurred to me the dissection might damage the worm resulting in inflammation and unsightly scarring. Moreover by the time I could get the necessary materials ready for an operation the worm had become less distinct. The patient did not seem to be much inconvenienced by it. She said she had a slight itching and a sensation of something creeping under the skin. I decided to await developments and asked her to see me again the next day. By this time the patch of erythema was much reduced and it was difficult to be certain that any part of the worm could be seen.

When I saw her again the next day the patch of redness was reduced to a small area about 20 mm. by 12 mm., raised about 2 to 3 mm. above the surface. There was no pain or any other sensation associated with it. I concluded that the worm had coiled itself into a resting stage comparable to that of *Loa loa* in a Calabar swelling or of *Onchocerca volvulus* in a nodule, and decided to excise the part completely with a view to securing the specimen. This was done on the 16th September and a clean wound which healed with a hardly-perceptible scar resulted, the final result being much better than would have been the case had I attempted to dissect out the worm when first seen.

The subcutaneous tissue and the dermis of the excised part were teased out with a pair of needles and a living worm which in the coiled state was calculated to be 90 mm. in length was removed and preserved in 10 per cent formalin. The worm has been studied by Dr. Maplestone at the Helminthological Research Laboratory, School of Tropical Medicine, Calcutta, and readers interested in its detailed morphology and the discussion of its generic classification will find a full account by him elsewhere in this issue. The original impression formed by me on clinical grounds and from a preliminary examination was that this worm is a Loa, but of a species hitherto unrecorded either from India or Africa. Sir J. N. Duggan who kindly loaned me another specimen removed from the same case and referred to later in this article regarded his specimen as *Loa loa*, but in a letter to me dated 8th September, 1937, he states that parasitologists in Bombay and Madras to whom he had shown his specimen were not convinced that it was *Loa loa*. Maplestone in his report confirms my views and considers it to be a new species, if not actually a new genus and has suggested placing it tentatively in the genus Loa.

(*Continued from previous page*)

sinusoid blood are given; these are based on sternum puncture in ten 'normal' Indian males.

Our findings are compared with those of other workers and discussed.

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He has named it provisionally *Loa inquirenda* and I agree that this has been aptly done in view of the lack of information regarding the male and embryos.

About a fortnight previous to the events related above, this lady called me by phone about midnight for an irritation in her left eye which had worried her for ten days and had suddenly become worse. I was out at the time and she was advised to see Dr. Chitnis, assistant to Sir Jamshedji Duggan of the Cowasji Jehangir Hospital, Bombay. Dr. Chitnis saw her that night and prescribed some drops but next morning when he examined her again, he declared that he could see a worm under the conjunctiva. Under a local anæsthetic, what were believed to be two worms, one 30 mm. and one 55 to 60 mm. in length, were removed and preserved. These were later very kindly loaned to me by Sir J. N. Duggan for examination and Dr. Maplestone considers them to be not two worms but separate portions of a single specimen which must have been severed in the process of removal. Unfortunately, the anatomical details in these fragments were damaged and the tail was missing. Portions of the uterus and the ovary indicated that the specimen was a female.

Fifteen thick films of the patient's blood have been examined for microfilariæ but none were found. These films were taken at various times both by day and by night. The eosinophilia was 6 per cent.

I have a note about this patient made about three years ago. She came to me then, complaining that she had noticed or felt what seemed to be a worm crawling under the skin of the front part of the thigh. When I saw her I could make nothing of it and dismissed the condition as a swollen lymphatic and of no importance. She reminded me of the occurrence when I removed this specimen.

She had been in Madras for three or four months in each year in 1920, 1923 and 1932. She visited East Africa on a short trip in 1935 and stayed in Nairobi for ten days. She was in Malaya from 1924 to 1931 and has been in Bombay since 1933. The patient herself thinks she was infected in Calcutta a few years ago on a short visit. She distinctly remembers, and her husband confirms the incident, being bitten by a large darkish fly which drew blood from the calf of her leg.

About eight months ago a male European consulted me about a pale worm-like structure which was irritating him on the right side of the abdomen just below the ribs. It seemed to me to be a distended lymphatic about 1 mm. wide and about 30 mm. long. I examined several thick films of his blood for microfilariæ with negative results. In the light of the present experience it is within the bounds of possibility that it was a similar worm. He was very worried about the matter and was insistent that it

(*Continued at foot of next column*)

A NEW FILARIAL WORM FROM A HUMAN BEING

By P. A. MAPLESTONE, D.S.O., D.SC., M.B., B.S., D.T.M.
(*From the Helminthological Research Laboratory, School of Tropical Medicine, Calcutta*)

THE clinical account referring to these worms and the records in India of worms found under similar circumstances are given in the above case report by Dr. Rishworth so this note is confined to the description of the parasites.

Specimen 1.—This was removed from an eye by Sir J. N. Duggan of Bombay and was found to comprise two fragments of a female worm. One portion about 6.5 cm. in length was the anterior end and it was 0.54 to 0.58 mm. in diameter. The head is bluntly rounded and the mouth is an inconspicuous opening in the anterior end, not surrounded by lips or other structures. The head papillæ are small and indistinct but two sub-median papillæ and a larger lateral papilla (amphid) could be made out on each side, near the anterior extremity. Cervical papillæ and excretory pore could not be found. The œsophagus is 1.25 mm. in length and is indistinctly divided into two portions, the anterior portion being about 1/10 of the total length. It is surrounded about the middle by the nerve ring. The vulva opens about 2 mm. from the

(*Continued from previous column*)

was a worm. I sent the man to a colleague in Bombay for a second opinion and he succeeded in convincing him that it was a lymphatic and nothing to worry about. It disappeared in about ten days and the man has now returned to England.

The following clinical features appear to be worthy of note. The formation of a red nodule in the skin preceded by a patch of erythema and irritation. The absence of microfilariæ in the blood, and the ease with which its occurrence in the skin might be overlooked. This would be even more likely in a dark-skinned patient. The presence of a worm in the patient's eye undoubtedly contributed to the discovery and removal from the skin of a second specimen. In the absence of so certain a clue as to the true nature of the condition it is not unlikely that other appearances of the species in the skin might be overlooked. This has probably happened on two occasions with me and I have described the circumstances in some detail in the hope that other observers may be assisted in detecting worms in similar circumstances.

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anterior end and the vagina runs directly towards the posterior from this opening. As the worm was cut and the body contents had for the most part escaped further description of the internal organs is not possible, except to say that even in the vagina no eggs or embryos were present but only granular cellular matter such as is seen in most nematode ovaries. The second fragment was 5 cm. in length cut transversely at both ends and almost empty of contents so no anatomical details could be observed. In correspondence sent with this worm there is a statement that when the pieces were examined soon after removal from the patient's eye cuticular bosses were seen. These could not be found when I examined the specimen: it is possible that the injury to the worm with the escape of the body contents and its subsequent flattening caused these cuticular knobs to disappear.

Specimen 2.—This specimen, removed by Rishworth from the side of the neck, is uninjured and hence can be more accurately described.

The worm is a female, 13-14 cm. in length and 0.6-0.64 mm. in greatest diameter. When first placed in the clearing fluid out of 70 per cent alcohol the head presented distinct 'shoulders' as shown in figure 1*b*, when the clearing fluid

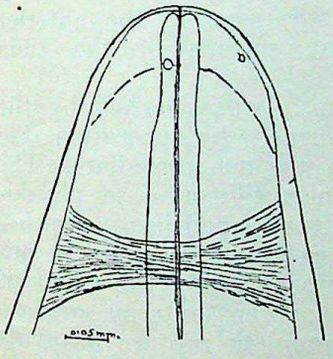

Fig. 1*a*.

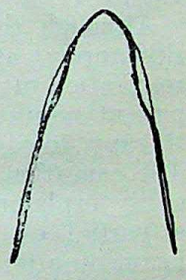

Fig. 1*b*.

Fig. 1*a*.—Anterior end showing papillæ, anterior portion of œsophagus, and nerve ring.
Fig. 1*b*.—Anterior end to show contraction before clearing (diagrammatic).

had completely impregnated the worm. the outlines of the cuticle and body tissue were parallel as seen in figures 1*a* and 2. The œsophagus is 1.16 mm. in length and the vulva opens 3.34 mm. from the anterior end of the worm. The vagina does not run straight backwards but after a short posteriorly-directed coil it turns forwards to the posterior end of the œsophagus where it again turns backwards and runs posteriorly for a distance of 6.6 mm. behind the vulva (figure 2) where it divides into the two uterine tubes. The uteri pursue a posterior parallel course, one or other branch exhibiting an occasional forward loop for a short distance. The final coils of the ovaries are near the posterior end of the worm but are at slightly different levels, the anterior one being 2.34 mm. from the tip of the tail and the posterior one 1.04 mm. from the same point. The ovaries only run about 1 mm. forwards from their posterior turns and then turn backwards again for a shorter distance before turning again forwards and so on in a series of three or four coils each coil being slightly shorter than

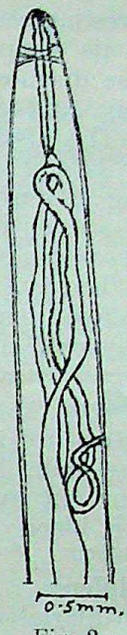

Fig. 2.

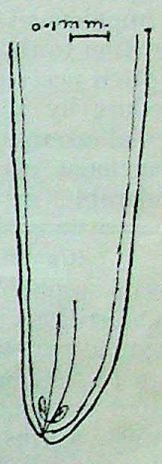

Fig. 3.

Fig. 2.—Anterior end showing vulva and vagina.
Fig. 3.—Posterior end.

its immediate predecessor so that the termination of the ovaries is a kind of elongate whorl. The uteri and vagina contain cellular material similar to that seen in specimen 1, but there was no sign of eggs or embryos even as far forward as the level of the vulva to which point this material reached.

The tail is straight and bluntly rounded, without cuticular flaps or papillæ and the anus opens almost at its tip. The cuticle is irregularly studded with bosses and there are fine transverse striations which are more distinct in the posterior third of the worm. Some groups of the cuticular bosses are very closely set and are unusually prominent giving the skin a remarkably rugose appearance, but it is considered that this is to some extent caused by shrinkage during fixation in cold formalin in which the worm was originally preserved, but some of the smaller bosses are undoubtedly natural structures.

Discussion

It seems probable that these two worms are of the same species because, apart from slight differences in some of the dimensions, all the comparable morphological characters are similar except the course of the vagina. In specimen 1 there is no loop and it runs directly back from the vulva, but the worm was cut across some distance further back and all the body fluids and a great part of the organs had escaped so it seems likely that this coil disappeared owing to the tendency of the body contents to escape through the cut end. Both specimens contained similar cellular material and no eggs or embryos.

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It seems probable that these worms are adult but unfertilized females through no males being present, a hypothesis that is borne out by the failure to find microfilariæ in the blood after repeated examinations.

These worms are clearly different from *Wuchereria bancrofti*, the common filarial worm of man in India. There is only one other possibly similar worm present in man in India, this is the parent worm of *Mf. malayi*, but the adult has never yet been found, and unfortunately the absence of microfilariæ in this case prevents this worm being identified with or distinguished from this unknown species.*

In some respects this worm is very like *Loa loa*, because the shape of the anterior end, the short œsophagus, the position of the vulva and the cuticular bosses are similar, but it differs from *L. loa* in being two or three times as long, in having a straight posterior extremity and the anal opening sub-terminal. The worm also differs even more distinctly from all other filarial worms of human beings that have been properly described so it is apparently a new species, if not a new genus.

On account of its close affinities with *L. loa* and the fact that it agrees in all available particulars with the generic definition of *Loa* given by Baylis and Daubney (1926) it is proposed to place it tentatively in this genus under the name *Loa inquirenda* thus indicating its doubtful position, which cannot be fully established until the male is found.

REFERENCE

Baylis, H. A., and Daubney, R. (1926). *A Synopsis of the Families and Genera of Nematoda.* The British Museum (Natural History), London.

*It is noticed that frequent references to this unknown worm are beginning to appear under the name *Filaria malayi*. This is unfortunate, because whatever the worm is, it is very unlikely to be a *Filaria* in the strict sense, so that when it is eventually found and described the alteration in its name will lead to similar confusion and possibly to similar opposition as that which occurred when the time-honoured *Filaria bancrofti* was changed to *Wuchereria bancrofti* under the rules of nomenclature.

SOME UNUSUAL JOINT LESIONS

By P. N. RAY, B.A., M.B., F.R.C.S. (Eng.)
Officiating Professor of Clinical and Operative Surgery, and Surgeon to the Medical College Hospitals, Calcutta

THE study of unusual and interesting cases of articular ailments is not without its compensation. In many of these cases, the diagnosis is a matter of considerable difficulty and treatment protracted and laborious. The disability and impairment of function may be out of all proportion to the pathological lesion. Moreover, it is often necessary to supplement any operative procedure by a prolonged course of graduated remedial exercises or of physio-therapy. The management of such cases, therefore, requires considerable experience and judgment. It is hoped that the conditions described in this paper will be found of interest.

I. Internal derangement of the knee: intra-articular tibial spur or exostosis

Although much has been written on the subject of internal derangement and athletic injuries of the knee joint, yet the rarity of an intra-articular tibial spur or exostosis seems to warrant the recording of the following case :—

Case I.—The patient, a Bengali male, aged 30, complained of a painful weak knee. Five years ago the patient was injured while playing 'soccer'. He was confined to bed for a month and the condition was diagnosed and treated as a sprain of the knee joint. The joint had never been free from pain since the injury. Some months ago, he was again injured when alighting from a tram car. There was much swelling of the joint and the pain was most marked when he attempted to stretch the limb fully. There was never any locking of the joint, nor was there any history of venereal disease.

On examination, the right knee was found to be swollen and free fluid was present. There was marked tenderness over the lower attachment of the external lateral ligament. All movements were painful but full extension was extremely so. The range of active flexion was just over 90 degrees. A 15 degrees flexion of the knee relieved the pain when walking. There was marked wasting of the quadriceps muscles, especially of the vastus internus. The patient was a well-built athlete and his general health was excellent.

Skiagraphy.—In the lateral view a small spine-like projection was seen in the anterior part of the articular surface of the tibia (figure 1).

Although the diagnosis was clinched by the skiagraphy and confirmed by operation, the restoration of function was not immediate. The patient required a prolonged course of physiotherapy for the weakened quadriceps muscles. The causation of the exostosis or spur is not easily explained. It was possibly the result of a partial ossification of the anterior cruciate ligament after an incomplete rupture or avulsion. This ligament becomes tense during extension of the knee and it prevents over-extension. It is attached above to the posterior part of the inner aspect of the external femoral condyle, and below to the upper aspect of the tibia in front of the tibial spine, either in front of or just mesial to the anterior cornu of the external meniscus. It is therefore probable that as a result of the 'soccer' injury there was a partial tear or avulsion of the anterior cruciate ligament, which was involved in the formation of the exostosis. The cruciate ligaments are ruptured only by severe injury. With regard to the mechanism of the rupture of the anterior cruciate ligament, it may be pointed out that it is caused by forced hyperextension of the knee joint together with internal rotation of the tibia on the femur and usually with the tearing of the internal lateral ligament.

II. Arthralgia of the shoulder joint: diaphysial aclasia

Extra-articular exostoses may give rise to troublesome pain in a joint. The shoulder

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possesses a lesser degree of stability and mechanical protection than any of the other large joints of the body. These anatomical considerations are of significance in the interpretation of the clinical features of affections of this joint. Arthralgia of the shoulder joint is seldom seen without some degree of limitation of movement. The following unusual case may be of interest:

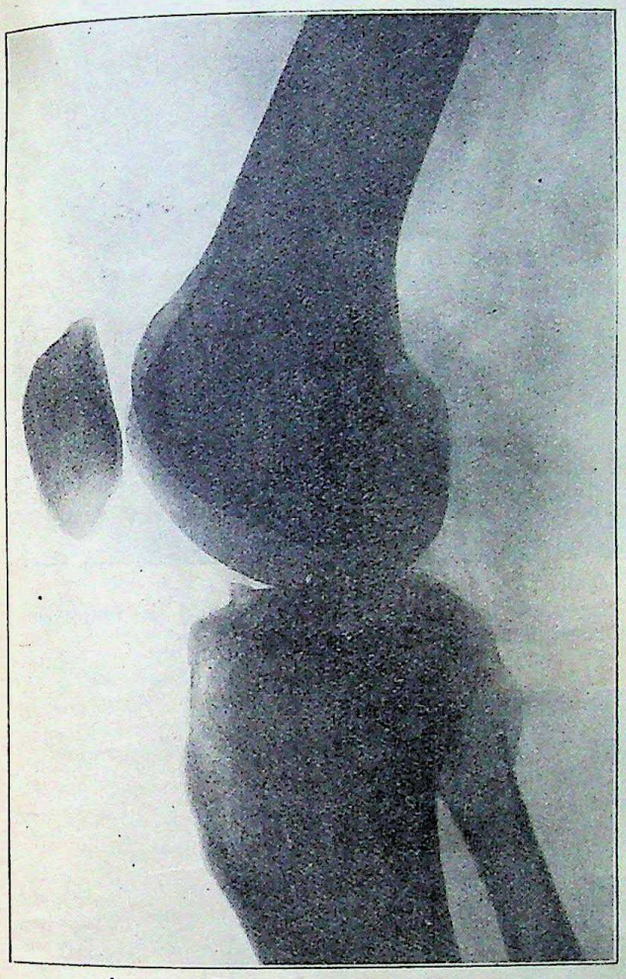

Fig. 1.—Intra-articular tibial spur or exostosis. In the lateral view, a spine-like projection is seen in the anterior part of the articular surface of the tibia.

Case II.—A Bengali boy, aged about 12, complained of weakness and pain in his left shoulder joint. There was no history of injury or infection. On palpation some irregularity in the shaft of the humerus was noted. The range of movements was limited in every direction. On skiagraphy, the underlying condition was revealed as diaphysial aclasia or hereditary multiple exostoses (figure 2).

This condition is a congenital or inherited skeletal deformity, characterized by irregular cartilaginous development and ossification at the ends of long bones, giving rise to multiple exostosis. After ossification of the affected epiphysis no further growth occurs in the exostosis. In this case, there were multiple exostoses in other parts of the body. The treatment of this condition is generally unsatisfactory. Any large exostoses interfering with muscles or tendons may be removed but where bony deformity is well marked radical cure is not to be expected.

III. Chronic arthritis of the wrist joint : chronic bone abscess of the radius

Tuberculous lesions of bones and joints require no comment, but there is a group of obscure infective bone lesions, which present many difficulties. The so-called 'Brodie's abscess' belongs

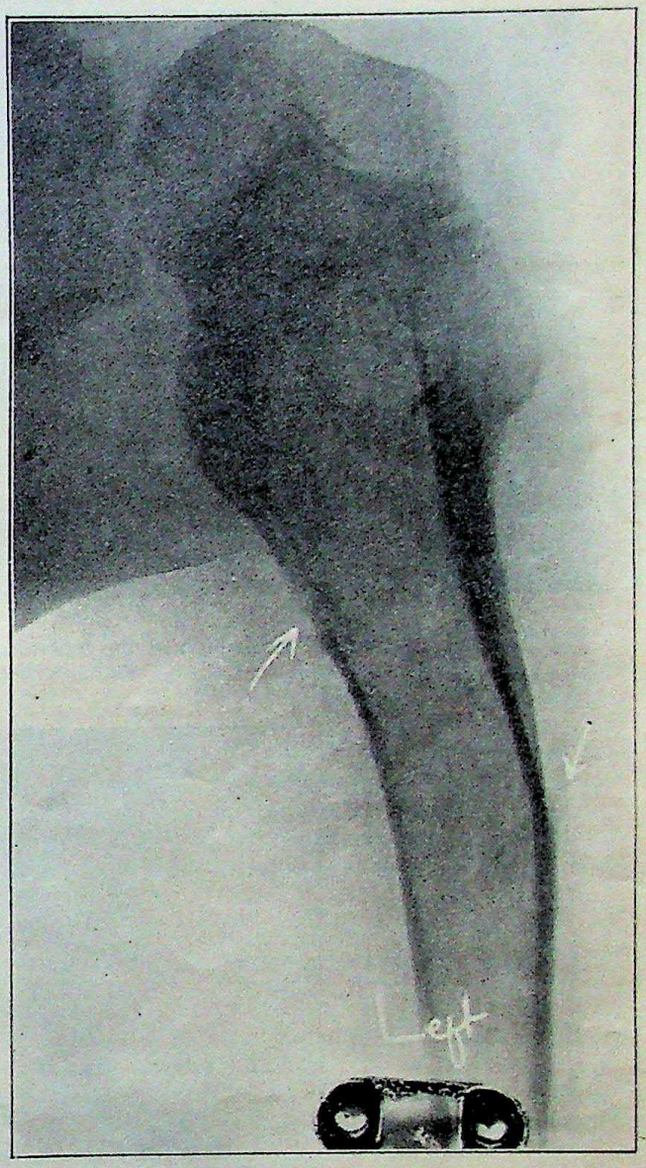

Fig. 2.—Note the deformity of the upper end of the humerus and multiple exostoses. A case of diaphysial aclasia.

to this group. It is surprising how often chronic osteomyelitis may be completely missed or wrongly diagnosed. In this connection the following case is of interest :—

Case III.—A Bengali boy, aged 12, complained of a painful and swollen wrist. There was no history of injury or recent illness. The onset was gradual and for nearly two months he had an evening rise of temperature, not exceeding 100°F. On examination, there was much swelling of the right wrist and all movements were painful and limited. The maximum tenderness was located over the lower end of the radius. The general health of the boy was poor and he looked small for his age. On skiagraphy, an area of rarefaction was seen in the metaphysis of the radius. The epiphysial cartilage was widened and the epiphysis

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showed well-marked irregularity. There was no obvious new bone formation or periosteal reaction (figure 3).

The diagnosis lay between (*i*) tuberculous disease of the bone, (*ii*) chronic bone abscess (subacute septic infection), and (*iii*) bone cyst. The limb was put up in a plaster casing for a period of eight weeks but there was no appreciable improvement. The cavity was therefore opened and well curetted. The curettage proved to be granulation tissue of chronic infection. The convalescence was rapid and uneventful. The so-called 'Brodie's abscess' is a localized form of osteomyelitis caused by a low-grade infection, commonly of staphylococcal origin. The infective area is usually surrounded by an area of osteosclerosis which is a characteristic feature in skiagraphy. In rare instances, this zone of sclerotic bone may be absent and may even show a degree of rarefaction, as in the present case, simulating a bone cyst or osteitis fibrosa cystica.

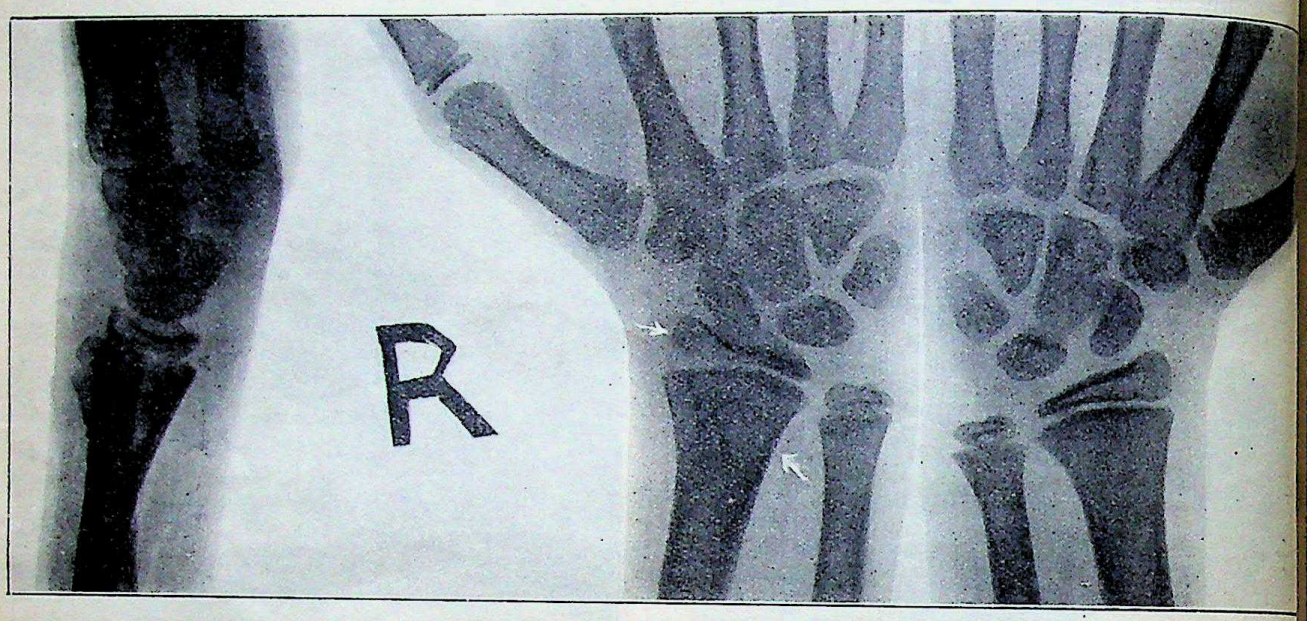

Fig. 3.—Note the area of rarefaction in the metaphysis. The epiphysial cartilage is widened and the epiphysis shows well-marked irregularity.

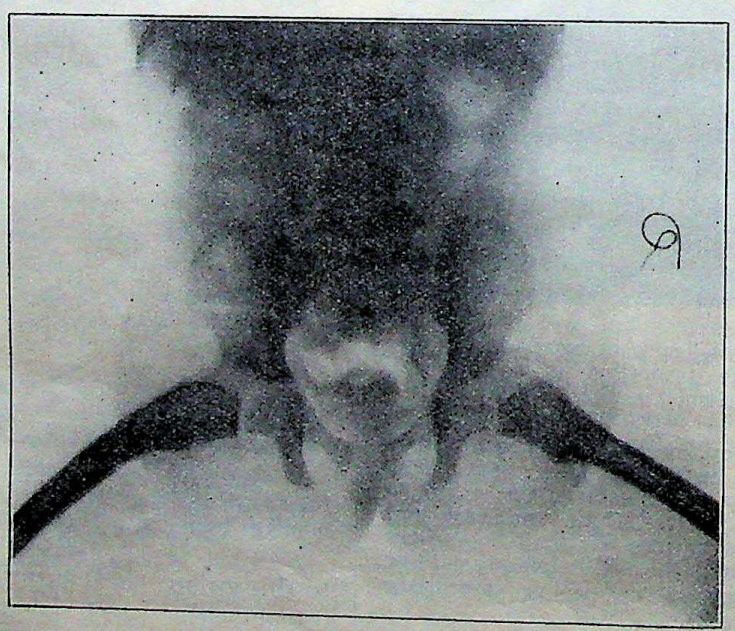

Fig. 4.—Coxa valga, following infantile paralysis.

IV. Coxa valga

Coxa valga is a rare deformity, in which there is an increase in the angle between the neck of the femur and its shaft. Consequently, the length of the limb may be increased. In coxa vara, on the contrary, the angle is diminished to a varying degree. The early manifestations of coxa valga are awkward gait and limping and thus it may be mistaken for tuberculous disease

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of the hip joint or coxa vara. It is usually congenital in origin but it may follow infantile paralysis.

Case IV.—A Bengali boy, aged 4, was found to be suffering from talipes equino-varus and extensive wasting of muscles of the lower limbs. He was unable to stand or walk. There was a history of infantile paralysis in early infancy. Skiagraphy showed bilateral coxa valga (figure 4).

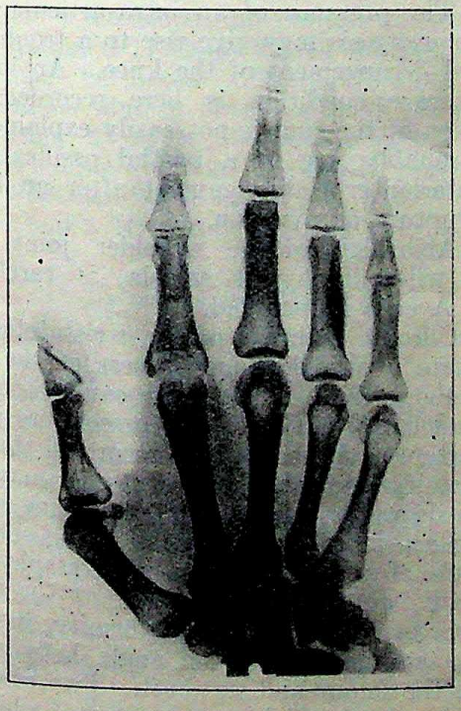

Fig. 6.—Antero-posterior view. Note disorganization of the metacarpo-phalangeal joint of the index finger, and osteosclerosis of shafts of the phalanges of the middle and ring fingers.

Coxa valga of congenital origin is generally unilateral but bilateral progressive lesions are by no means uncommon.

Case V.—A Bengali boy, aged 10, was brought in for limping and awkwardness of gait. On examination, it was found that the thighs were outwardly rotated and abducted. There was a history of rickets in infancy and, in the opinion of the mother, he was a delicate child. The diagnosis was confirmed by skiagraphy (figure 5). With regard to treatment, the hip joints were manipulated under anæsthesia and immobilized in plaster in an attitude of adduction. The result was fairly satisfactory.

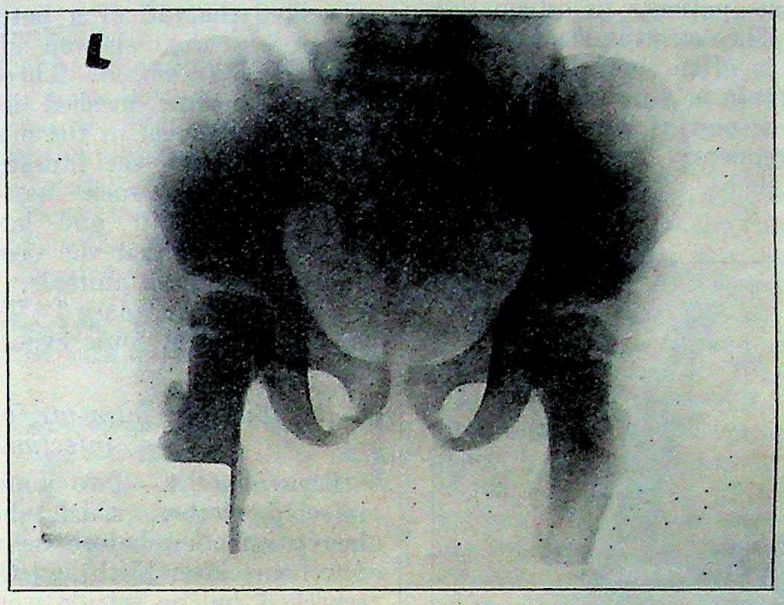

Fig. 5.—Coxa valga of congenital origin.

It is important to note that re-education of gait is a difficult process at all times. With children both patience and perseverance are needed. In paralytic cases the prognosis would be dependent upon the extent and nature of the paralysis.

V. Charcot's disease of a metacarpo-phalangeal joint

Charcot's disease of the hand is very uncommon. The following case is of interest not merely on account of its rarity but also because of the presence of osteosclerosis of the shaft of two other phalanges.

Case VI.—A Bengali male, aged 45 years, complained of a painless swelling over the root of the right index finger and loss of movement in the joint. There was no history of injury or gout. The onset was sudden and the duration three or four years. The patient admitted having syphilis about twenty years ago. On examination, there was an irregular swelling of the metacarpo-phalangeal joint of the right index finger, painless and without any tenderness. There was hardly any voluntary movement of the muscles. On passive movement a soft grating sound was elicited. There was no wasting of the thenar and hypothenar muscles and dissociated anæsthesia was absent. Pupils reacted to light equally, but the knee jerks were very sluggish on both sides. The Wassermann reaction was negative. No other joints were involved. On skiagraphy, the joint appeared to be disorganized with loss of cartilage and bone, of both the head of the metacarpus and the base of the first phalanx. The latter also showed generalized decalcification. The corresponding phalangeal bones of the middle and ring fingers showed osteosclerosis of the shafts (figures 6 and 7).

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The large joints are more liable to be affected, the knee and the tarso-metatarsal joints being the most commonly involved in tabes and the shoulder in syringo-myelia. But in tabes even the smaller joints may be affected, as in this patient. Female tabetics appear to be relatively more liable than male patients to osteopathies and arthropathies. The exciting cause of a tabetic arthropathy is often some trivial traumatism, such as a sprain or strain in a joint, in which the sensation of pain is impaired or lost, hence the greater frequency of tabetic arthropathies in the lower limbs.

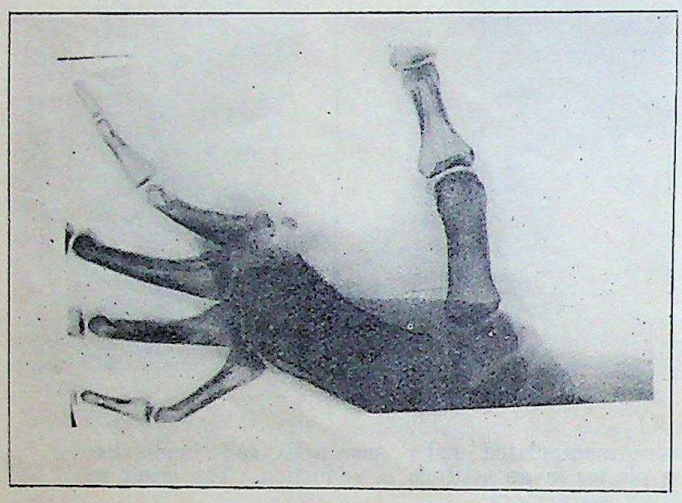

Fig. 7.—The lesions are shown in the lateral view.

The onset of symptoms is nearly always sudden, dramatic and painless. Sometimes the patient wakes up from sleep to find that a joint has become greatly swollen, flail or useless. Sometimes the changes follow a slight sprain. Occasionally, however, the onset may be insidious. The appearance of a Charcot's joint is generally an early manifestation and may be the first evidence of the existence of tabes. The other signs, such as the Argyll-Robertson pupil, loss of knee jerk, visceral crisis, ataxia, Romberg's sign, dysuria, etc., may follow later. There is often a firm œdema round the joint, which may extend for some distance above the limb. A crepitus may also be felt.

The prognosis varies greatly. In some cases, the swelling may gradually disappear after a few weeks. In others, it may remain stationary without either regression or progress. The diagnosis is usually readily made by the presence of other tabetic manifestations, by the painless sudden onset and the clinical and radiological characters of the swelling. The differentiation from syringo-myelic arthropathy is not usually difficult. The chief characteristics are (*i*) muscular atrophy, particularly of the thenar and hypothenar eminences, (*ii*) involvement of the whole limb, and (*iii*) dissociated anæsthesia.

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EXPERIMENTS ON THE SPIRILLUM OF RAT-BITE FEVER

By B. M. DAS GUPTA

(*From the School of Tropical Medicine, Calcutta*)

KNOWLES, DAS GUPTA and SEN (1936) have observed that 15 of a batch of 31 white mice (*Mus musculus*) showed spontaneous infection with *Spirillum minus*. These mice were caged in cages of narrow meshed iron-netting. No rat could possibly get at the mice to bite them. On looking through the literature it is found that other workers such as Robertson (1930), McCluskie (1930), and lately Francis (1936) have also recorded the occurrence of natural infection in these animals. How does this dissemination take place? To throw some light on this problem some experiments were carried out.

Possibility of intra-uterine transmission of infection

Experiment 1.—Two young mice born of an infected mother, which showed a moderately heavy infection before delivery, were killed a few hours after birth and their heart blood was searched, but no spirilla were detected in either

(*Continued from previous column*)

Summary

Some unusual joint lesions are considered briefly in this paper.

(1) The presence of an intra-articular tibial spur or exostosis may give rise to a troublesome internal derangement of the knee. An instance of this rare condition is here recorded. The causation of the spur is not easily explained. It was probably due to a partial ossification of the anterior cruciate ligament after an incomplete rupture or avulsion.

(2) Arthralgia of the shoulder joint, associated with diaphysial aclasia, is rarely met with. A case is recorded.

(3) Chronic arthritis of the wrist joint may be due to a chronic bone abscess of the lower end of the radius. The abscess cavity is usually surrounded by an area of osteosclerosis. In rare instances, as in the case recorded, this zone of sclerotic bone may be absent and may even show a degree of rarefaction, simulating a bone cyst or osteitis fibrosa cystica. The so-called 'Brodie's abscess' is generally of staphylococcal origin.

(4) Coxa valga is a rare deformity, in which there is an increase in the angle between the neck of the femur and its shaft. Two cases are recorded, one of which was congenital while the other followed infantile paralysis.

(5) Charcot's disease of the hand is very uncommon. A case of Charcot's disease of the metacarpo-phalangeal joint is recorded. It has the additional unusual feature of being associated with osteosclerosis of the shaft of the other phalanges.

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Besides, two mice inoculated with this material showed no evidence of infection.

Experiment 2.—The blood of six mice of one litter of an infected mother was examined 26 times from the 15th day of birth during a period of two months. The results were consistently negative. The mother and the offspring were caged together all the time.

Experiment 3.—The blood and peritoneal fluid of two six-weeks-old mice born of an infected mother were subjected to intensive search for spirilla with consistently negative results. But they were readily infected following an inoculation of the mother's blood, the spirilla appearing in the peritoneal fluid on the 4th day in one and on the 9th day in the other.

Possible spread of the infection by the ingestion of food contaminated with the urine of infected animals

Experiment 4.—Two clean mice were put together in a small cage for 42 days. The only food that was given to these animals consisted of a small piece of bread and a piece of carrot or sweet potato soaked in urine collected from a number of infected mice. No infection resulted.

Experiment 5.—One mouse was fed on 14 specimens of urine (introduced to the back of the throat with a capillary pipette) during a period of 22 days from five infected mice. The animal was then kept under observation for nearly two months (56 days). No spirilla were detected in the blood and peritoneal fluid which were examined 17 times during the period.

It may be noted in connection with these experiments that to obtain a small quantity of urine from a mouse is quite a simple matter. The technique consists in lightly pressing the lower abdomen when one or two pellets of fæcal matter and a few drops of urine are invariably voided.

Transmission by coitus

Experiment 6.—Two adult mice of opposite sex were caged together for 40 days. The male harboured the specific parasite. The female was separated from its companion when it showed evidence of advanced pregnancy. It gave birth to five young, one of which was killed by the mother within a few hours of its birth. Neither did the mother nor the offspring take the infection.

Besides the foregoing transmission experiments, investigations were also carried out, from other aspects of the disease, in man and animals.

Tolerance to re-infection

To determine whether an attack of rat-bite fever confers any degree of immunity against further infection the following experiment was undertaken :—

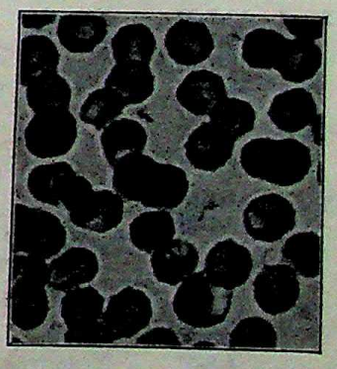
Experiment 7.—A healthy volunteer was infected with a strain of *S. minus* spontaneously occurring in a white mouse. After he had three bouts of fever, he was treated with arsphenamine therapy and he recovered. Two months later he was re-inoculated with the same strain which had been maintained in a young guinea-pig. No infection resulted. Eight months after the initial inoculation he was given an inoculation with the spirilla isolated from a wild rat without infection resulting.

Wassermann reaction in experimentally-infected human beings and guinea-pigs

Experiment 8.—In this investigation two human volunteers and four guinea-pigs were used. The blood of the volunteers who denied all history of syphilis was examined for Wassermann reaction. The results being negative, they were infected with *S. minus*, originally isolated from a human case and maintained by passage through white mice. When the infection was generalized in these individuals, as shown from the isolation of the specific parasite from the blood by animal inoculation, their blood was tested again, and gave absolutely negative reactions. The guinea-pigs were infected from one of the above cases. The blood of the guinea-pigs was examined before inoculation and after a well-established infection. Before inoculation the blood of three animals was negative and that of the fourth gave a doubtful reaction. After the infection the blood of all the four animals was definitely positive.

Prevalence of spirilla in the peritoneal fluid of mice

All observers who have studied this spirillum in laboratory animals agree that a white mouse is the most susceptible animal. Unfortunately, this animal, as mentioned above, is liable to spontaneous infection. It has, therefore, been suggested that, before a diagnostic inoculation for rat-bite fever, the blood of the mouse should be examined carefully to ensure that it is free



Blood smear of an infected mouse showing scanty spirilla. (Photomicrograph × *ca.* 850.)

from natural infection. But owing to the fact that marked fluctuations in the number of the parasites occur in the blood from day to day, as first pointed out by Robertson (1930), one or two examinations of blood smears are useless. It was suggested to the writer by Prof. Schüffner

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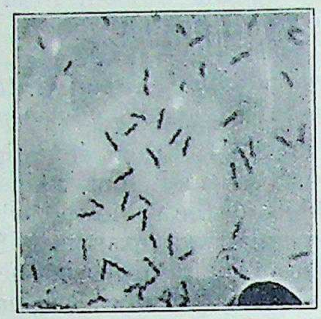
that in experimental leptospiral infection in guinea-pigs very scanty infection can be detected in the peritoneal fluid. It was, therefore, thought that similarly scanty infection of *S. minus* in a white mouse might be more easily detected in the peritoneal fluid than in the blood.



Smear of peritoned fluid of the same mouse, showing a massive infection. (Photomicrograph × *ca.* 850.)

Accordingly, a comparative study on the prevalence of spirilla in the blood and peritoneal fluid in the infected mice was made.

Experiment 9.—Four adult mice were infected from a wild rat harbouring the spirillum. The blood and peritoneal fluid of these mice were examined by dark-ground illumination on seven occasions in three and two occasions in one and the results are presented in the following table :—

Number of mouse	Date of examination	Spirilla in	
		Blood	Peritoneal fluid
Mouse no. 1	21-6-37	Scanty	+ +
	5-7-37	,,	+ + +
	17-7-37	,,	+ + +
	20-7-37	+	+ + +
	22-7-37	+	+ + +
	1-8-37	Negative *	+ +
Mouse no. 2	12-7-37	Negative	+
	13-7-37	,,	+
	15-7-37	,,	+
	18-7-37	+	+ +
	20-7-37	+	+ +
	25-7-37	+	+ +
	28-7-37	+ +	+ + + +
Mouse no. 3	13-7-37	Negative	+
	15-7-37	Very scanty.†	+ +
	18-7-37	,,	+ +
	19-7-37	Scanty	+ +
	22-7-37	,,	+ +
	25-7-37	,,	+ +
	4-8-37	Negative	+
Mouse no. 4	12-7-37	Negative	+
	14-7-37	Very scanty.‡	+

*Negative implies failure to detect the spirillum in wet preparation examined for five minutes by dark-ground illumination.

†Only one spirillum seen in 5 minutes' search.

‡The animal was found dead next morning. Autopsy showed hepatization of the bases of both lungs.

Discussion

Troisier and Clement (1922) noted the presence of the parasite (*S. minus*) in the blood of the offspring of infected mothers. Salimbeni and his associates (1925) favoured the view of the possibility of hereditary transmission. Lately Levaditi *et al.* (1934) have shown that *S. minus* in white mice can be transmitted from the mother to the offspring either *in utero* or by the ingestion of infected milk. With regard to the prevalence of the spirilla in the mammary glands of white mice, out of 18 lactating females 17 contained the organism, while the number of uterine infections in the same lot was 7 out of 15. On the other hand, Abe (1924), Worms (1926) and McDermott (1928) are inclined to believe that hereditary transmission does not occur. One of these observers (McDermott) ground up the tissue of a young mouse born of an infected mother and injected into a series of mice, but failed in each instance to obtain the infection. In this connection, three sets of experiments (experiments 1 to 3) were carried out by the writer; in no instance was any evidence of intra-uterine transmission of infection discovered.

With regard to the transmission by the ingestion of infected milk, the present author failed to confirm the findings of Levaditi *et al.* (1934) who have noted that the ingestion of infected milk is the most potent source of transmission of the infection.

Mooser (1925) noted an instance in which an infection in a rabbit was transmitted by coitus. In view of the experimental results (experiment 5) obtained by the writer it is doubtful whether this is a mode of infection in mice.

Tsuneoka (1917) has observed that the specific organism is found in the urine and the infection can be transmitted through this agency. The present writer has failed to produce infection in mice by feeding for weeks on urine or food contaminated with the urine of infected animals. Basu (quoted by Knowles and Das Gupta, 1928) and Arima (1933) failed to transmit the disease by the bites of the fleas which showed only gut infection for a short time after the infected feeds. It may be said therefore that the mode of the propagation of the disease in white mice still remains obscure.

The results of experiment 5 show that an individual who has recovered from an experimental rat-bite fever becomes absolutely refractory to further infection with the disease no matter whether the specific parasite is isolated from a naturally-infected mouse or from a human patient.

Conflicting results have been recorded by previous workers as regards Wassermann reaction in rat-bite fever. Arkin (1920) records a negative Wassermann reaction in his own case but states that Kunusaki found one positive case in five. Costa and Troisier (1918), Maurice (1918), Caldwell and Templeton (1932) and Briggs (1922) have reported cases with positive

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Wassermann reaction. Blum and Clément (1925) state that they found reports of 14 cases with positive and 12 with negative Wassermann reactions. They record an instance in which there was a negative reaction before and positive one after infection with rat-bite spirillum. In the light of the investigation carried out by the writer (experiment 6) there is no evidence at all that a rat-bite fever case in the absence of coincident syphilis gives a positive Wassermann reaction. But the guinea-pigs after an established infection with *S. minus* gave positive reactions.

Summary

Experimental rat-bite disease has been studied in man and laboratory animals. Litters born of infected mothers (mice) have proved negative for spirilla, nor did they show any evidence of immunity to infection with the disease. Infection could not be produced in mice by feeding them on urine of infected animals or food contaminated with it for weeks. Adult mice of opposite sex were caged together. The male harboured the specific parasite. Neither the female nor its offspring were found infected in spite of repeated and careful examinations.

Experimentally-infected human volunteers gave consistently negative Wassermann reaction, but the guinea-pigs infected from these individuals showed positive reactions. The blood of these animals (four in number) before infective inoculation was absolutely negative in three and doubtful in one. The circumstances in which this complement-fixing property is shown by the infected guinea-pigs are a subject for a biochemist to investigate.

A comparative study on the prevalence of the spirilla in the blood and peritoneal fluid of the infected mice showed that the number of the spirilla in the latter does not diminish to an appreciable extent till the animal dies of the disease or of some intercurrent infection; whereas it is subject to marked fluctuation from day to day in the blood from which the spirilla may even temporarily disappear altogether.

After an attack of experimentally-induced rat-bite fever, man proved absolutely refractory to further infection.

I wish to express my gratitude to Major S. D. S. Greval, M.D., I.M.S., for the Wassermann tests required for one of the above experiments.

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(*Continued at foot of next column*)

SIPHUNCULINA FUNICOLA (EYE-FLY)*

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Siphunculina funicola, the eye-fly, is familiar in the Deccan, Assam and many of the provinces in India. It has been credited with disseminating several inflammatory conditions in

* This article is in the nature of a preliminary note only. Work on the eye-flies' systematic position in the insect world, the existence of other species in the same genus in India, characters distinguishing it from them, details of anatomy and morphology in the different stages and the life history, is in progress and will be published in due course.

(*Continued from previous column*)

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the eye†; at the least, it is a persistent nuisance. It is a tiny blackish insect and in general anatomical structure resembles flies of the brachycerous type (*see* plates and diagrams).

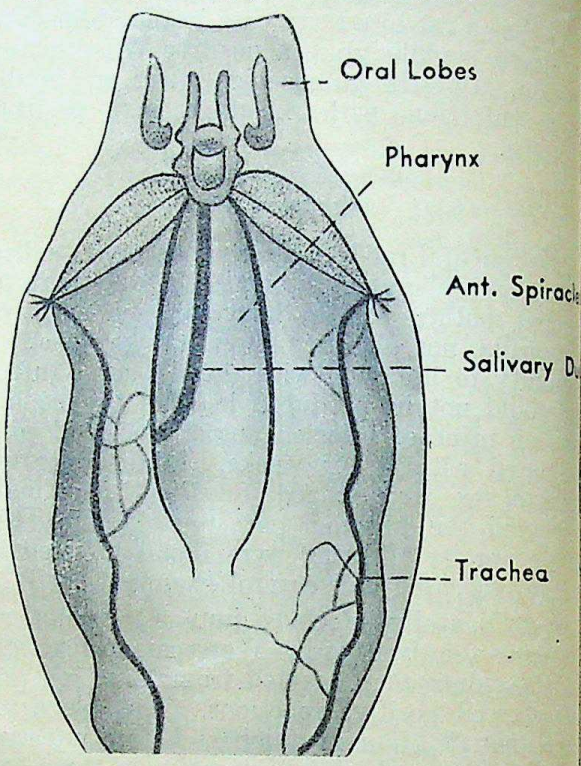
Life history.—This has not, I believe, been completely observed or recorded. The span of life is not definitely known. In captivity eye-flies do not live more than 4 to 5 days. It is likely that the duration of developmental stages varies with temperature. The periods given below represent the averages of several breedings carried out under warm weather conditions. The males in nature preponderate to the extent of three or four to one female. The males can be readily distinguished from the females by the absence of an ovipositor.

The breeding place *par excellence* is moist mud, particularly that contaminated by decomposition of organic matter. The damp soiled earth around improperly kept pail latrines is a favourite breeding place; breeding has been found in badly-kept cattle stables and more frequently in connection with badly-kept and contaminated surface drains.

Flies are capable of laying about 40 to 50 eggs. Each ovarian tubule contains 2 or 3 follicles and there are about 8 to 9 tubules on each side. From one fly 46 almost mature eggs were dissected.

The eggs (*see* plate II) are creamy white in colour on the average 0.4 mm. in length, one end round, the other tapering. They are marked with longitudinal striations and are convex on one side and slightly concave on the other. When water is poured on mud containing the eggs they float up, but sink again after a few hours.

The *larva* (*see* plates and diagrams) is typically acephalous. It hatches out in three days. The posterior end is obliquely truncated. There are three larval instars; it is not yet definitely known when the first and second ecdyses take place. The larva when it comes out of the egg is extremely small and almost transparent. It has no anterior spiracular processes. It exhibits slight undulating movements. The cephalo-pharyngeal skeleton is present. It feeds voraciously on organic matter and soon increases in size. After the first ecdysis the larva loses its skin as well as the cephalo-pharyngeal sclerites. The larval stage lasts 4 to 5 days. In the last stage it becomes creamy white due to excessive development of the fat body. It has thirteen segments. Just behind the head on either side are the openings of the anterior spiracles. These are provided with five finger-like processes. The tracheæ are continued backward and on their way give off numerous branches. These end posteriorly in the posterior spiracles. The posterior spiracles consist of two nodes one on each side just in front of the last segment. The tracheæ are carried through these nodes and end in a circular ring which is deeply pigmented. Above the ring there are two openings side by side and these are surmounted on the surface by a ring of very fine pigmented bristles.



The alimentary canal and the excretory system resemble those of other muscid larvæ.

External morphology of larva.—The 7th to the 12th segments bear locomotory pads. These are arranged in three rows—

(*i*) central rows consisting of six pads (*ii*) two paracentral rows also six in number and (*iii*) two lateral rows are in pairs.

† Reference Major C. S. P. Hamilton's paper read on 6th February, 1937, in the Assam Branch of the British Medical Association and Memorandum by Professor P. A. Buxton, Director of the Department of Entomology, London School of Hygiene and Tropical Medicine.

EXPLANATION OF PLATE II.

Fig. 1. *Male fly.*
1. Absence of ovipositor.
2. Antenna.
3. Proboscis.

Fig. 2. *Female fly.*
1. Ovipositor.
2. Legs.

Fig. 3. *Female fly.*
1. Ovipositor.
2. Proboscis.

Fig. 4. *Pupa.*
1. See the fly inside the pupa.
2. Pupa case decolorized with chlorine (pot. chlorate treated with hydrochloric acid).

Fig. 5. *Pupa.*
1. Transverse tear in the case out of which the imago emerged.
2. The anterior and the posterior spiracles.

Fig. 6. *Larva.* (Fully mature, stained with hæmatoxylin.)
1. Oral lobes.
2. Œsophagus.
3. Pharynx.
4. Anterior spiracles.
5. Trachea.
6. Locomotory pads.

Fig. 7. *Larva.*
1. Mandibular sclerite.
2. Cephalo-pharyngeal skeleton.

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PLATE II

Fig. 1.

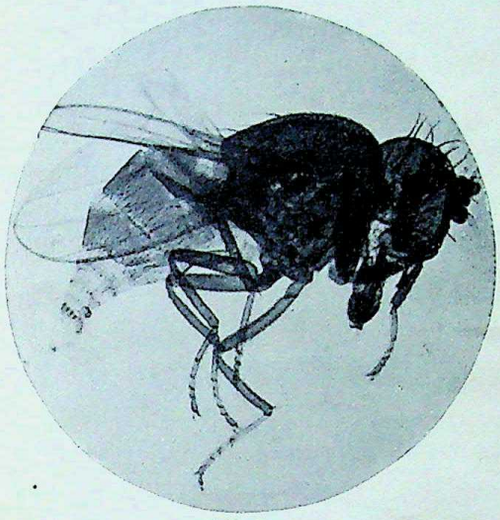

Fig. 2.

Fig. 3.

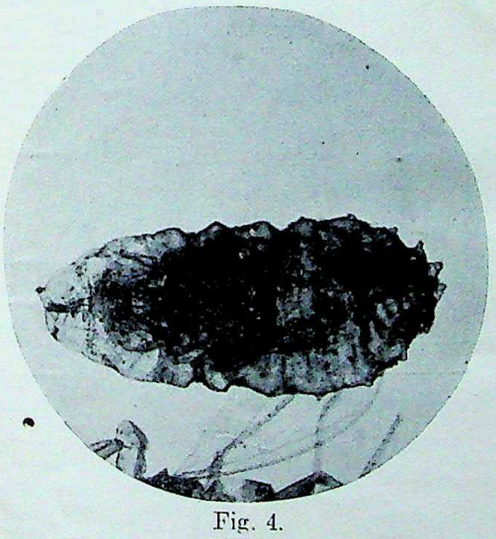

Fig. 4.

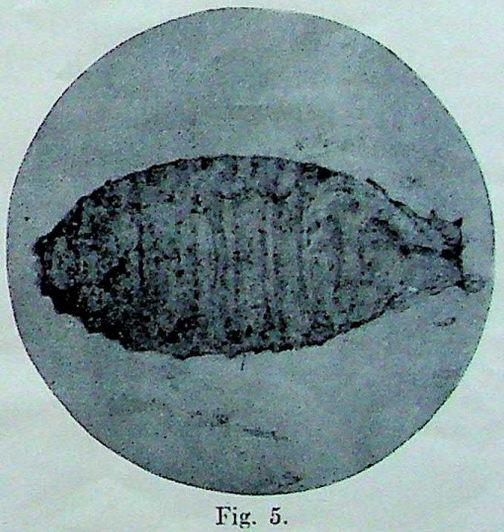

Fig. 5.

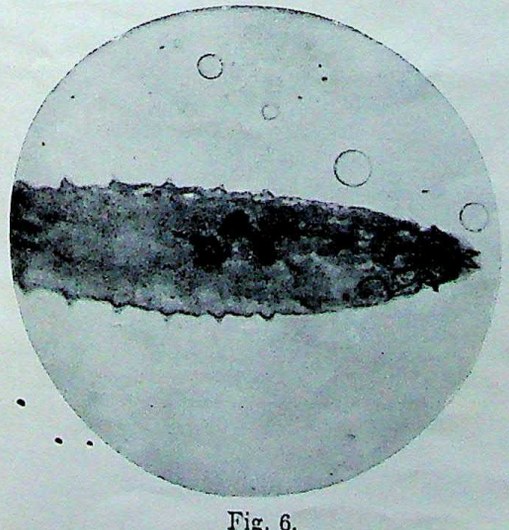

Fig. 6.

Fig. 7.

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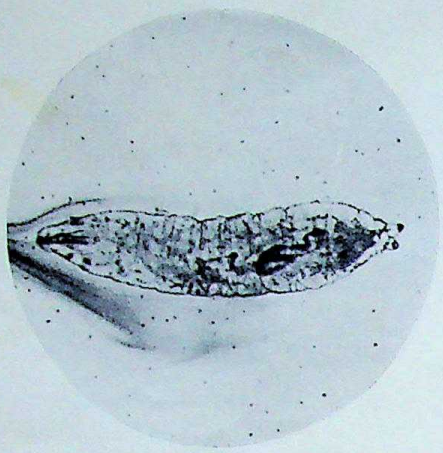

Fig. 8.

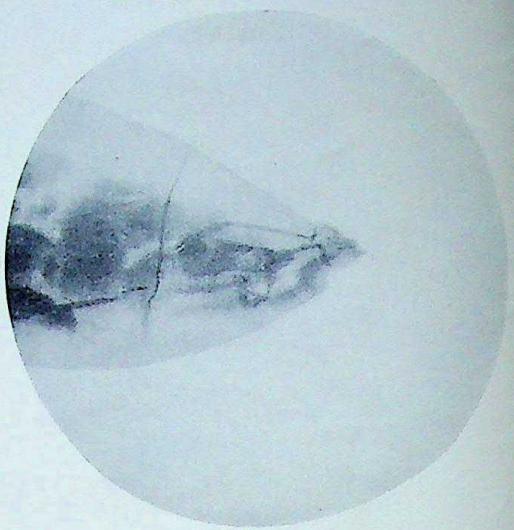

Fig. 9.

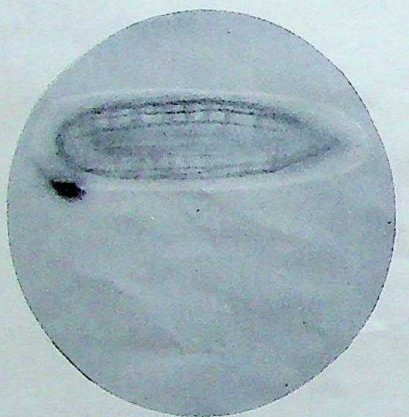

Fig. 11.

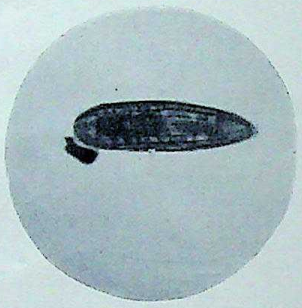

Fig. 10.

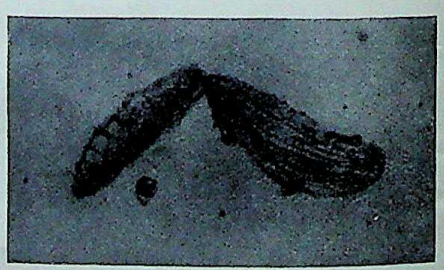

Fig. 12.

Fig. 13.

Fig. 14.

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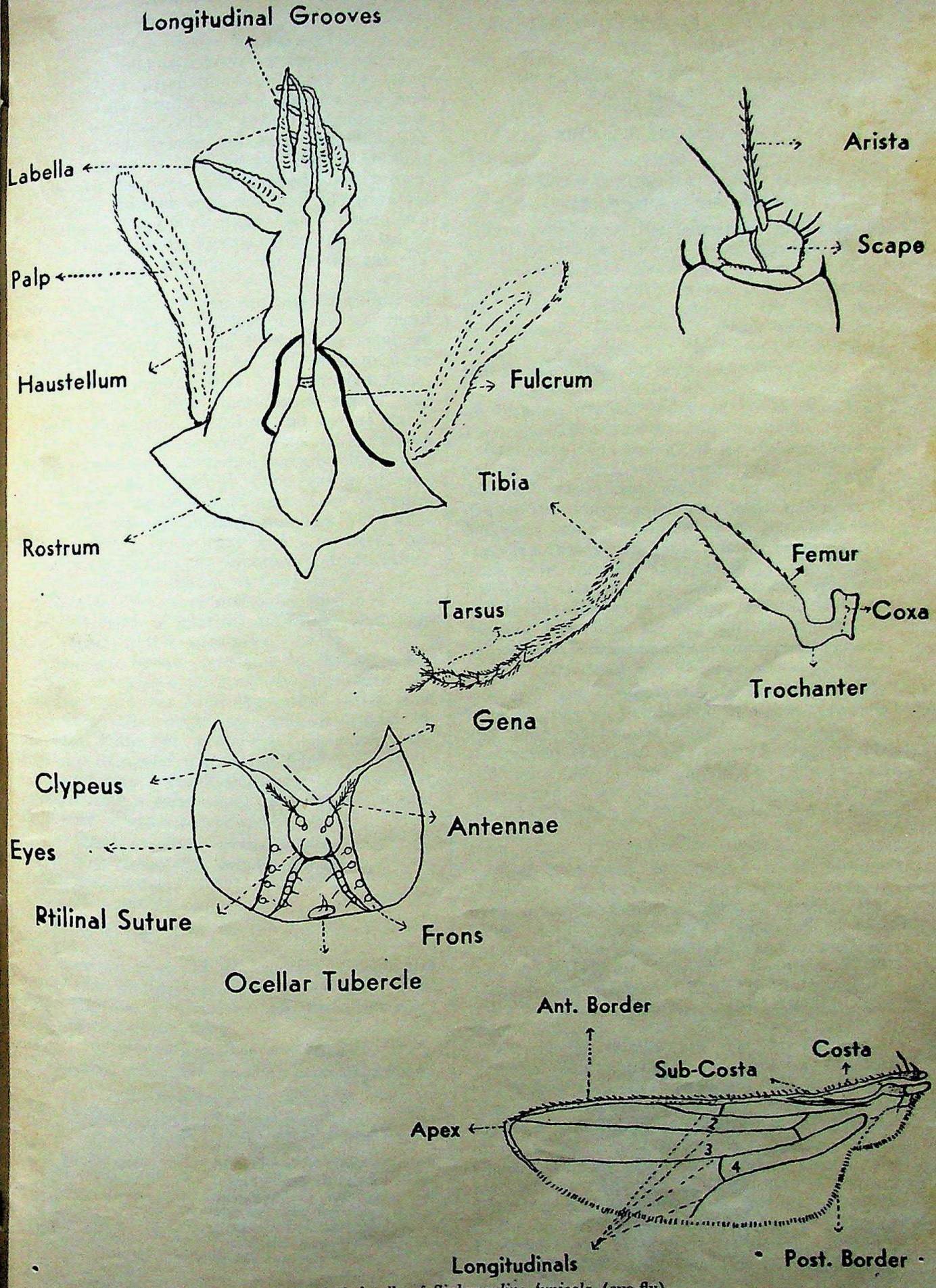

Anatomical details of *Siphunculina funicola* (eye-fly).

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Two additional pairs are also present, one on the posterior side of the ventral surface of the last segment and two posterior to the anus.

Pupa.—Soon after the last moult the larva begins to turn brown at the anterior end and becomes sluggish. This brown pigmentation spreads to the hinder end and ultimately the whole becomes a light-brown pupa. At first light brown the pupa later becomes dark brown. It has also thirteen segments and the spiracles projecting. The pupal stage lasts about two days and the imago emerges through a transverse opening in the pupa case at the anterior end.

Habits.—These insects are apt to collect in very large numbers on hanging strings, blind cords or hanging electric light flexes and in cobwebs. A flex used by the flies in large numbers was painted with two per cent fluorescein solution. Next morning a search was made for fluorescein in gutters and similar places round about and was readily detected in several drains of the type described already, 100 yards or so away. It is clear that the flies go at least this distance for food and deposition of eggs.

The flies lay eggs in large numbers when kept in test-tubes. These eggs failed to hatch out within two months at laboratory temperature or even when incubated at body heat.

Cobwebs, etc., on which these flies rest were spattered with a whitish substance. No eggs were found in this substance.

When the female is about to lay eggs she becomes sluggish, continuously massages the abdomen with her hind legs, time after time protruding the ovipositor and widening its aperture with her proboscis. Ultimately, the eggs are delivered with some fluid.

Bacteriology.—The following organisms were isolated from a serum-agar slope on which eye-flies were allowed to crawl :—

(1) *Staphylococcus aureus.*
(2) Non-hæmolytic streptococci.
(3) Enterococci.
(4) Diptheroids.

The mould growing on the slope was *Mucor mucedo.*

I have not been able to isolate any flagellates from the malpighian tubules as yet. That these flies can give rise to and spread conjunctivitis is very probable.

(*Continued at foot of next column*)

EXPLANATION OF PLATE III.

Fig. 8. *Larva.* 1. Posterior spiracles. 2. Double row of lateral locomotory pads.
Fig. 9. *Larva.* 1. Mandibular sclerites—enlarged.
Fig. 10. *Eggs.* 1. Longitudinal striations, slight concavity on one side and convexity on the other.
Fig. 11. *Eggs.* Same as above—enlarged.
Fig. 12. *Eggs.* 1. Larva has just emerged out of the egg.
Fig. 13. *Testis.*
Fig. 14. *Ovaries.*

MYELOID LEUKÆMIA TREATED BY DEEP *X*-RAY THERAPY

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THE problem of the leukæmias continues to be formidable in spite of some vigorous efforts to overcome it. Once the disease is diagnosed, it spells death for the patient, for the physician helplessness and in the end disappointment. However, in recent years a ray of hope has brightened the prospects of temporary alleviation by deep *x*-ray therapy in this disease. We choose to describe below a case of chronic myeloid leukæmia which has been very much benefited by this treatment.

Regarding the ætiology of the disease there is yet a good deal of controversy going on. Although there are many who attribute the disease to some infection and quote fowl leukæmia as an example of it, and although the virus theory still needs a lot of experimental work to be accepted or rejected, yet the majority agree that it is a neoplasm of reticulo-endothelial tissue in which, in the case of myeloid leukæmia, the myeloid tissues of the

(*Continued from previous column*)

I have seen eye-flies sucking serum not only from wounds on horses but also from wounds and ulcers on human beings. The jungles in Hyderabad (Deccan) abound with these insects and since the sylvan population suffer much from yaws, these flies may play some part in the dissemination of this disease.

Preventive measures

These flies used to abound in Hyderabad (Deccan). Since the anti-malarial measures were taken in hand, all gutters, drains, etc., have been continuously sprayed with 'Malariol' to destroy mosquito larvæ, and eye-flies have almost entirely disappeared. It appears that 'Malariol' not only destroyed the culex larvæ but also the adult eye-flies and their larvæ.

My sincere thanks are due to Colonel J. Norman Walker, C.I.E., I.M.S., Director, Medical and Public Health Department, H. E. H. the Nizam's Government, whose keen interest, suggestions and assistance helped in this preliminary work. I also thank Doctor C. F. Chenoy, Deputy Director of Public Health, for his advice, Doctor M. Farooq, Chemical Examiner and Bacteriologist, for his assistance in the bacteriological work, Doctor A. Rahman, Professor of Physiology, Osmania Medical College, for taking the photographs and my colleagues for much assistance.

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bone marrow become the seat of malignant change.

Whatever the origin of it, the disease is by no means uncommon in this country. Some of these cases are overlooked for a long time and are labelled as cases of chronic malaria with splenomegaly or confused with kala-azar where the latter disease is endemic.

Case report

Doctor A. R., aged nearly 35 years, well built, height 5 feet 10 inches, had a feeling of pain in the abdomen in April 1936. As he was constipated, he took a soap-and-water enema and after he had evacuated he noticed an enlargement of the spleen for the first time. It was nearly four fingers below the costal margin. This enlargement of the spleen was attributed to chronic malaria and he therefore began to take quinine and arsenic without any improvement. On the contrary he began to feel a little run down and had some disturbance of digestion.

By about 9th February, 1937, when the blood films were examined the diagnosis of chronic myeloid leukæmia was made. By this time the spleen was nearly nine fingers below the costal margin. The only point of interest in the past history was that he had hæmoptysis some 10 years ago. He was *x*-rayed then and it was suspected that he had a tuberculous lesion in the right lung. Subsequent to this diagnosis with rest and good food he always felt very fit.

After a preliminary complete blood examination, treatment was started on 10th February, 1937, according to the following technique:—

Exposure factors: K.V.P. = 200, M.A. = 4, filter 5 mm. aluminium; time five minutes, to make a quarter erythema dose: distance ten inches.

First exposure to back of spleen, 2nd—right groin, 3rd—left groin, 4th—back of neck, 5th—upper part of thorax, 6th—left shoulder, 7th—right shoulder, 8th—both feet, 9th—lower part of both legs, 10th—middle part of both legs, 11th—both knees, 12th—middle of left thigh, 13th—middle of right thigh, 14th—sacrum and lower lumbar vertebræ, 15th—lumbar and lower dorsal region. Except after the fifth and the subsequent six exposures when an interval of three days each time was given because the patient felt rather sick, the treatment was given daily.

Only at the first sitting was the spleen exposed (at another clinic), otherwise it was always the bones. Total and differential leucocytic count, made before the treatment was started, showed total leucocyte count 112,000 per c.mm., with differential leucocytic count giving nearly 90 per cent polymorphonuclears and 12 per cent myelocytes. Hæmoglobin percentage nearly 80 per cent and total red cell count 4,800,000 per c.mm. Wassermann reaction negative.

After the first five exposures the total count fell to 37,000 per c.mm., while the polymorphonuclears came down to 80 per cent with 2 per cent myelocytes. Total red cell count rose to 6 million whilst hæmoglobin remained steady. Three more counts have been done at about a month's interval after the completion of the course of treatment. The first examination showed 12,000 leucocytes with 70 per cent polymorphonuclears and no myelocytes. The second about the same and the third done at the end of June showed 11,000 leucocytes with occasional myelocytes. The spleen has steadily diminished in size and now nearly three months after the treatment is not palpable even after a deep breath. There has been a remarkable improvement in the appetite, energy and weight. The case is being watched closely and it will be seen how he progresses subsequently.

Discussion

There are two points at issue in this case. Firstly whether tuberculosis bears any relationship to this disease for it has been noticed more than once that in some of these cases in who an earlier tuberculous infection has been ove come by rest and treatment there is develo ment of myeloid leukæmia later on. Wh Custer and Crocker (1932), after reviewing t literature on the subject, conclude that occurrence of true leukæmoid condition caus by tuberculosis is yet to be confirmed autopsy. Thomas Cherry (1933) presents ve interesting experimental data by inoculati mice with minute doses of virulent tuber bacilli and thereby producing definitely leukæmic condition and neoplasm of pylorus.

Secondly, as to how the beneficial effect in t case has been brought about only by e posure mainly of the bones. In a recent arti by Napier, Sen Gupta and Chaudhuri (192 on the treatment of this disease an explanati has been put forth to rationalize the treatme In their cases only the splenic region was e posed. One of the theories put forth by the is 'That the destruction of the immature ce from the metastases in the spleen produces lytic substance that destroys or depresses t growth of the metastases in all parts of t body'.

This theory is evidently untenable in t present case for the spleen has been expos only once at the beginning of treatment. The are perhaps two explanations feasible for t good effect of the *x*-ray treatment of th disease.

1. That the *x*-ray exposure of bones direct affects the hæmopoietic tissue and therel checks its malignant activity. This explai the benefit only in the present case, but fails explain the achievements of other clinicia who have benefited their patients by eith exposure of the spleen alone as Napier *et* have done or by exposure of the whole bod alternately ventral and dorsal sides, witho specially taking up the bones or the splen region. The right explanation may be that Euginio Milani (1931). His theory is that leucocytic crisis, and has been further elab rated by Raphael Isaacs (1932) by his inves gations on the maturing effect of *x*-rays blood-forming cells.

Milani believes that though the reduction the number of white cells is the most appare phenomena, it is not the fundamental one in t mechanism of improvement. This destructi occurs in crisis analogous to that occurring the spontaneous leucocytic crisis in all leuk mias, the difference being that in those whi occur after treatment the *x*-rays provoke a leuc cytic increase which in turn provokes the cri of destruction. The author gives figures taking daily white counts and proves how aft a marked rise in leucocytes a sudden cris which greatly reduces the count, occurs.

Isaacs states that the effect of Roentg irradiation, small or large, on developing c

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SOME RECENT ADVANCES IN SURGERY*

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IN September 1930, the late Lord Moynihan of Leeds, when delivering the opening address of the academic year of one of the greater London medical schools, gave it as his considered opinion that the limits of surgery as an art had been reached, and that any further attempt to enlarge it would consist of what he termed 'operative indiscretions'. It is not for me to criticize the accuracy of the statement of Lord Moynihan as regards operative technique, but that this accuracy did not extend to pathology, or rather to the applications of pathology to surgical treatment, was dramatically emphasized by the publication in October 1930 by an American orthopædic surgeon, Dr. Winnett Orr, of an unassuming little book, *The Treatment of Osteomyelitis*. I shall have occasion to refer to this subject more in detail a little later in this lecture. I merely mention it now as an instance of the fallibility even of the greatest scientists when dealing with those inexact sciences which make up the work of the medical profession.

A similar statement to that of Lord Moynihan was made in the late seventies of the last century and was almost immediately followed by the publication of the work of Lister, a work which, as you are aware, revolutionized the practice of surgery and brought within the successful orbit of the surgeon many diseases and parts of the body which previously had been considered as unsusceptible of surgical treatment.

Lister's work let loose a flood of surgical discoveries which extended throughout the last quarter of the nineteenth century and continued almost unabated till the outbreak of the last war. The experience gained by surgeons on active service provided material for a second and minor spate of advance in surgical technique which continued into the 1920's; and it is only within the last 7 or 8 years that this spate seems to be falling in volume and the waters, so to speak, to be settling, and the surgical profession to have leisure to stand still and take stock of its discoveries. This stock-taking process has been a marked feature of the last 7 or 8 years and it is on some aspects of its results that I propose, with your permission, to address you to-night.

The general tendency of surgery during the last 7 or 8 years has been in the direction of conservatism. Many surgical procedures which were in vogue 10 years ago are now considered, in the light of further experience, to be in the nature of 'operative indiscretions'; and the conservative treatment adopted by some of 'our fathers in surgery' both before and during the time of Lister is, in some cases, returning into vogue. But, whereas formerly they might be ascribed either to lack of operative courage or to an incomplete knowledge of the process concerned, their modern adoption has behind it the sanction of pathology, a science which has made strides as striking as those of operative surgery, and over an almost exactly parallel period of time. Particularly is this conservative tendency noticeable in the modern treatment of acute infections.

John Hunter in the seventeenth century enunciated the principle of the treatment of infections as 'Where there is pus let it out'; and this principle has governed, and generally successfully governed, the treatment of acute septic processes unchallenged until quite recently. In the early years of this century a distinguished German surgeon, Professor Bier, advocated a conservative attitude in dealing with acute infection, no matter in what tissue it was found. This teaching was expressed in the system of treatment of acute infections by passive congestion to which the name of 'Bier's treatment' was given; this received a great deal of attention in the early years of this century and, moreover, has undoubtedly done much to improve the results of the treatment of acute infections. It is to-day employed in these conditions even by champions of active interference, with the object of bringing the inflammatory process within easier reach of the knife of the surgeon; and therein, in my view, lies its greatest benefit.

*An address delivered before the South Indian Science Association, at Bangalore, on 5th January, 1937.

(*Continued from previous page*)

is always stimulation, the cells in the myeloblastic stage react by proliferation and multiplication and that of the myelocytic stage by rapidly going through all stages of maturation. Thus there is never any depression of bone marrow; the larger dose causes such a rapid rate of growth that the normal end is reached sooner and the cellular activity appears then to be depressed. The reduction in cell counts is due really to the natural death of mature cells which have achieved senility although this senility has been hastened by *x*-ray therapy. To summarize, therefore, the good effect of deep *x*-ray therapy is brought about by stimulation of leucocytic formation and their maturation which subsequently ends in complete destruction of the mature cells as it happens in the normal course of events.

We are indebted to Major N. A. Qureshie for the details of the *x*-ray treatment.

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More recently, however, a French professor, D'Herelle, has demonstrated that the bacteria which are the causes of many acute conditions are themselves subject to invasion by even more minute organisms which are known as the 'eaters of bacteria', or bacteriophages. As the infection progresses, and if the patient survives, the vigour and virulence of the invading bacterium progressively diminishes until it finally ceases; D'Herelle proved that in some instances, at any rate, the final extinction was due to the parasitic action upon the bacteria of the bacteriophages. Among the organisms in which D'Herelle established this phenomenon was *Staphylococcus aureus*, which is the common organism of septic processes. The modern tendency, therefore, is now in the treatment of such staphylococcal manifestations as boils and carbuncles, to apply a convenient and occlusive dressing and to rest the part while the bacteriophage is developing, and to abstain from operative and possibly mutilating measures. My own experience in this form of treatment, I must confess, has not been entirely happy. I find that the results are not on the whole as good as those of free incision and evacuation in conditions such as boils and abscesses; while in carbuncles the results of total excision of the infected area have been, in my experience, superior either to the old-fashioned crucial incision and removal of sloughs or to the attempt to produce the bacteriophage. At the same time, in common with the advocates of the conservative theory, my experience has been that occlusive, and especially hygroscopic, dressings will frequently abort an infection which in the old days would have been encouraged to 'point' by fomentations and have involved the use of the knife with its subsequent scarring, however slight. I suggest that the next 8 years will see probably a synthesis of the two measures—conservative treatment in so far as it is successful in aborting, and operative where this form of treatment has demonstrably failed.

In one form of acute inflammatory disease the last 7 years have seen an advance, to which, in my opinion, it is not inappropriate to apply the adjective 'revolutionary'. I refer to the treatment of osteomyelitis, or inflammation of bone, whether acute or chronic. Up till the latter half of the third decade of the present century, the recognized treatment for this distressing disease of childhood was freely to expose the affected bone, to remove not less than one-third of its circumference as far as the infection extends and irrigate lightly with antiseptic, to pack in antiseptic dressings and allow the wound subsequently to heal from the bottom by granulation. Apart from the deformity which this necessarily and frequently involves, anyone who remembers such cases in the children's wards, with the daily agonizing dressings, which frequently in the early stages necessitated an anæsthetic, and the drawn, pinched and frightened faces of the children concerned, will not need any further illustration of the objections to such treatment. It w these considerations which moved the Americ surgeon, Dr. Winnett Orr, to make an extens study of the disease, and the conclusions wh he reached may briefly be summarized as fo lows :—

Osteomyelitis is primarily a disease caused b one organism, usually *Staphylococcus aure* The previously recognized method of treatme while admittedly giving adequate drainage the products of this infection, necessarily subst tuted a mixed infection with other organis before the primary monorganismal infection w controlled. Even in these days of aseptic su gery, it is impossible to avoid conveying infe tion to an open wound in daily dressings. D Winnett Orr considered that the undoubte toxæmia was due to this mixed infection; wh the daily excruciating dressings were responsib for such damage to the nervous system a general health of the child, that only t assumed necessity justified them; and in ma cases an original amputation would have be more merciful. The logical deduction whi Dr. Winnett Orr reached was that the ration treatment of osteomyelitis should be to elimina the infection if possible, and at all costs avoid the mixed infection; and from this dedu tion developed the Winnett-Orr technique, whi may briefly thus be described.

The affected bone is exposed as befo throughout the extent of the infective proces Thereafter sufficient, but only sufficient, bone removed to give adequate exit to the produc of infection. Structures which are obvious already devitalized are removed and the cavi in the bone is lightly cleaned so as to avo damage to such of the bone-forming cells a blood vessels as have survived the infectio The wound is thereafter swabbed out with 10 per cent solution of iodine in rectified spir and the excess of this solution is removed wi absolute alcohol. Thereafter sterile autoclave paraffin is poured into the cavity which is mor over lightly packed to the surface with steri gauze well-soaked in the paraffin. Sterile para fin-soaked dressings are applied over the woun with sterile cotton-wool, in the ordinary way The limb is then immobilized in plaster of Pari *no window being left*, and the plaster extendin sufficiently to immobilize the joint above an the joint below.

Dr. Winnett Orr claims that, provided adequat bone technique be observed during this opera tion, mixed infection is avoided and the origin infection if not eliminated is, at any rate, greatl attenuated. The subsequent process of granula tion goes on freely and undisturbed under protective coating of paraffin, while the abso bent dressings absorb the discharges, which not sterile, are of an extremely lowered virulenc Nothing short of a grave constitutional distur ance, in Dr. Winnett Orr's opinion, justifies t opening of the plaster under three weeks; an when its opening is carried out, it is found th

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the granulations, when the discharges have been washed away with sterile saline, are healthy, vigorous and, above all, insensitive. The original steps, including and subsequent to the application of iodine, are repeated and the part again replastered.

The same principles are followed in the treatment of chronic osteomyelitis, *i.e.*, when mixed infection has been established by the bursting of the abscess to the exterior with subsequent necessary dressings. In these cases a greater or less proportion of the bone concerned has been killed and forms what is known as the sequestrum, while the defensive reaction of the body and notably of the periosteum has thrown down round it an envelope of new bone known as the involucrum. The sinus communicates with the exterior through a hole in the involucrum which is known as the cloaca. In dealing with such cases the Winnett-Orr technique differs only in degree. Nature has limited the infective process to the cavity of the involucrum. This, therefore, is laid open and the dead bone or sequestrum removed and the cavity thereafter is treated exactly as that produced in the acute infection by the interference of the surgeon.

When, in October 1930, I saw this system of treatment carried out at the Bristol General Hospital, my comment to myself at the time was that 'this is murder'! I followed that case through, and as a result, I have committed well over 200 such 'murders' since, varying from the complete removal of the diaphysis of the ulna to the partial removal of the os calcis. I have lost two cases: one from tetanus, presumably due to the survival of spores in the paraffin which in the earlier cases I used sterilized in boiling water but not autoclaved; and one debilitated child with chronic osteomyelitis, who caused the anæsthetist grave anxiety during the operation and died from delayed shock. Of the other cases I would only say that so far from having no cause to regret this treatment, each successive case makes me its more enthusiastic champion. The average number of dressings in an ordinary case of sequestrotomy by this technique is 4, at three weekly intervals. When the patient finds that the first dressing is painless, his fear is abolished; whereas from the moment the treatment is adopted the pinched toxic look is replaced by one of well-being which is a contrast as dramatic as it is satisfactory.

You will naturally say that this description is too enthusiastic and that there must be some snags. There are. Contrary to the recorded opinion of Dr. Winnett Orr, these cases smell, and smell abominably; and it is essential, at any rate during the earlier stages, that they be treated on the verandah. This is the only drawback to the treatment of which I am aware; but it is a serious drawback as any member of my nursing staff will tell you.

Peritonitis.—Another instance of conservative trend in modern surgery is in the treatment of diffuse peritonitis or of the paralytic distension of the bowel which follows extensive intra-abdominal operations, and which may persist in cases of intestinal obstruction after the mechanical obstruction has been relieved by operation.

Modern opinion supported by pathology has reverted to the main principles of the technique of 50 years ago, supported by the additional appliances which development has placed in our hands. The injections of drugs to stimulate the paretic intestinal muscles have proved unsatisfactory, and they have now been largely replaced by allowing the muscles to rest while guarding against distension and supporting the body fluids. The modern treatment of this condition is the drainage of the intestine by the in-dwelling duodenal tube, to preclude distension of the stomach, the administration of intravenous saline and glucose by the continuous drip method, thereby replacing the lost body fluids and chlorides and supplying the liver with an assimilable form of nourishment, guarding against restlessness by injections of morphine, and relieving pain by hot fomentations to the abdomen, and leaving the bowels to act in their own good time.

Another and more recent suggestion, which is fascinating in theory and deserving of a very thorough trial, is to combine this treatment with inhalation of almost pure oxygen. It is known that the cause of death in paralytic ileus is the absorption of the toxins produced in the paralysed loops of the gut by the multiplication of anærobic organisms. These organisms are normally inhabitants of the large intestine, and can only develop in the small intestine in the presence of stasis of its contents and in the absence of oxygen. The theory of oxygen inhalation, therefore, is that by inhaling pure oxygen the partial pressure of the gas in the alveoli of the lungs is raised; and therefore the partial pressure in the systemic circulation, including that which nourishes the paretic loops of the bowel, is also similarly raised. This increase in the oxygen supply to the gut is supposed to inhibit the development of anærobic organisms and prevent the elaboration of their toxins. If I may be pardoned a personal note in a general survey, I would suggest that the application of this technique in 'Ragi' obstruction be given an extended trial. My own results in three cases have been very encouraging.

Burns.—The treatment of burns has been improved out of all recognition in the last 7 years by the introduction of the use of tannic acid. Prior to the use of this drug, the treatment of burns was unsatisfactory in the extreme. The shock of the burn itself, the toxæmia from the inevitable mixed infection during the long drawn out dressings, and, when healing had taken place, the contractions of the scars involved, all combined to make the immediate mortality of the condition high, and the ultimate results unsatisfactory, from mutilation.

With the introduction of tannic acid which originally was sprayed upon the burnt area,

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after a thorough cleansing under an anæsthetic with antiseptics, and which produced an extensive coagulum over the whole burnt area beneath which healing rapidly took place, the immediate improvement in the treatment of burns was extremely dramatic. But there still remained a certain proportion of cases in which, for various reasons, the coagulum failed to 'take', either wholly or in part. The secretions accumulating underneath it tended to separate the coagulum from the underlying tissues; and imperfect cleansing permitted sepsis to go on, with the result that a greater or lesser amount of blistering occurred and allowed the septic process in some cases to continue. Experience has proved that the combination of antiseptics, such as Dettol, with the tannic solution has tended to obviate these causes of failure. In many cases where spraying alone is unsuccessful, the removal of the blisters and the application to the denuded area of fomentations of a strong solution of tannic acid with antiseptic will induce coagulation in the areas concerned. The net result of the tannic acid treatment of burns has been to reduce the immediate mortality in a very marked degree, and almost completely to obviate, on the one hand the necessity for skin grafting, and on the other hand the contractions which so frequently follow healing.

Fracture.—In the West, the treatment of fractures has also made remarkable strides during the last few years. The use of the portable *x*-ray apparatus in controlling the reduction of the fracture and the formation, in most large hospitals, of fracture clinics have combined to ensure accurate reduction and intelligent and thorough after treatment. The latter has been further facilitated by the use of the unpadded plaster cast after reduction, according to the teaching of the distinguished Austrian orthopædic surgeon, Dr. Böhler. With the perfection of these methods the operative reduction of fractures in which I was trained by Sir Arbuthnot Lane is increasingly receding, in the opinion of most surgeons, into the realm of 'operative indiscretions'. While this may be a subject for regret to the lover of artistic operative technique, there can be no question that it makes for the general good of the public. The technique of bone surgery as enunciated by Sir Arbuthnot Lane is both meticulous and difficult of achievement, but it is absolutely essential to success. Sir Arbuthnot Lane stated that the only reason for a failure in bone operations was 'dirty surgery', and thereby stated a profound, if unpalatable, truth. If, therefore, equally good results can be obtained by methods which do not impose such restrictions upon the surgeon, it follows that a much greater measure of success will be obtained. Moreover, ample scope for artistic and specialized operating remains to the orthopædic surgeon in those cases in which, for various reasons, the union is either faulty or absent after reduction and treatment by conservative measures. In such cases the drill, steel plates, and screws of Sir Arbuthnot Lane have been mostly replaced by the 'bevelled bone craft'. A large number of ingenious instruments has been invented for the purpose, but the fact remains that an orthopædic surgeon may take as much pride in a well-fitting and successful bevel-graft as may the expert cabinet maker in a beautiful dove-tail.

Peptic ulcer.—This disease still, unfortunately, remains a field of battle between the physician and the surgeon; but as the years pass by there is evidence that a peace which is honourable to both sides and beneficial to humanity at large is drawing nearer. We are to-day concerned with the surgical aspect of this disease; and this must necessarily vary with the point of view of the individual surgeon. I may, therefore, perhaps be excused if I venture to summarize the subject according to my personal convictions which are briefly as follows :—

Subject to certain exceptions, to which I shall refer later, peptic ulcer is, in my opinion, primarily a medical disease. Whatever be its causation (and there are many theories in the field) one factor is almost invariable; and that factor is the excess of acidity in the gastric juice. In the vast majority of early cases, if the excess of acidity can be controlled by medical means the peptic ulcer will heal and the symptoms disappear. It then becomes incumbent on the patient to continue medical treatment of the condition indefinitely. Only when such treatment has demonstrably failed, or when complications (constituting the exceptions which I shall propound) have occurred, does the condition come within the realm of the surgeon.

The exceptions which, apart from failure of medical treatment, dictate surgery may be summarized as severe hæmorrhage, perforation, or the suspected onset of malignant change in the ulcer. This latter applies exclusively to gastric ulcers, since carcinoma of the duodenum is so rare as to constitute a pathological curiosity. To these exceptions I would add the occurrence of a peptic ulcer in an Indian patient of the uneducated peasant class in whom the maintenance of dietary restrictions after medical treatment is if not impossible, at least very improbable. Assuming that such conditions have arisen as dictate surgery, what is the modern opinion as to the operation of choice ?

The operation of gastro-jejunostomy devised and perfected by Lord Moynihan is falling into disrepute. For this, neither the operation nor its originator can be held justly to blame, but rather the indiscriminate use—or misuse—of the measure after imperfect investigation. As we are all aware, the operation consists in making a short circuit between the pyloric end of the stomach and the upper end of the jejunum to encourage the acid products of gastric digestion to pass directly into the small intestine without traversing and irritating the duodenal ulcer. In practice, this is only partially obtained unless

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the pylorus is at the same time closed; and one-way traffic is the exception after this operation. Further, the operation does nothing in itself to lessen the excessive production of acid by the stomach cells. As a result, unless it is performed in carefully selected cases, not only does the immediate result desired, *i.e.*, the healing of the duodenal ulcer, not take place but an added complication may, and frequently does, arise in ulceration at the stoma, in consequence of undiminished acidity in the gastric juice and imperfect healing at the site of anastomosis. This complication which is becoming, unfortunately, increasingly common, is one of the most devastating conditions that either physician or surgeon can have to treat. The operation of gastro-jejunostomy, therefore, should, in my opinion, never be performed in the presence of high gastric acidity, and it should also never be performed for the relief of duodenal ulcer unless there be at the same time stenosis of the pylorus with marked gastric delay. For the latter condition, produced by the scarring of a long-standing chronic pyloric or duodenal ulcer, gastro-jejunostomy is still not only justifiable but also successful.

Modern researches into gastric digestion have shown two salient facts; the first is that acidity is produced entirely by the cells in the fundus of the stomach and in its body; the normal secretion of the pyloric antrum is alkaline in reaction. Moreover the cells of the pyloric antrum not only produce the chemical stimulus to the secretion of the digestive juices, gastrosecretion, but also produce the as yet unisolated anti-anæmic factor, which is supposed to activate the liver and to guard, in the healthy body, against the development of Addison's anæmia. It follows, therefore, that for the cure of peptic ulcer the ideal operation should diminish the secretion of gastric acidity, either remove the ulcer concerned, or establish conditions which allow of healing, and preserve the functions of the pyloric end of the stomach. This 'physiological' operation has, in fact, been devised by the distinguished Austrian surgeon, Finsterer, and is receiving increasing notice from surgeons in other countries, notably Ogilvie in London, and Somervell and Orr in India.

As we are aware, 90 per cent of gastric ulcers occur at the lesser curvature proximal to the pyloric antrum. Finsterer's operation may, therefore, be summarized as the removal of as much as possible of this ulcer-bearing acid-secreting portion of the stomach, leaving only the fundus. The occlusion of the pyloric antrum of the stomach leaves the pylorus open to receive its alkaline secretion; and the establishing of a small stoma between the jejunum and the remainder of the stomach in such a fashion as to constitute an amended lesser curvature or 'gastric pathway', permits of maceration and digestion of the stomach contents, and allows of a modified gastric digestion by what remains of the acid-pepsin in the gastric juice.

This then is I think now generally accepted to be the ideal operation for peptic ulcer, whether it be gastric or duodenal, which demands surgical interference. It is a procedure not unattended with operative and technical difficulties; and therefore its importance, in cases of mechanical obstruction and normal acidity, is not to be considered as superior to that of the simpler gastro-enterostomy, which, indeed, should be reserved for these cases and these cases only.

Other regions.—Space only permits of brief reference to other notable surgical advances. The work of Chevalier Jackson in America and of Tudor Edwards in London has opened up a wide field of useful surgery in the thorax. The improved methods of diagnosis elaborated by the former have permitted cancer of the lung to be diagnosed in its early stages and have brought the condition within the successful orbit of the surgeon. Ten years ago the excision of the whole or part of the lobe of a lung would certainly have been considered an 'operative indiscretion'; but nowadays, with intra-tracheal anæsthesia, the operation is, in the hands of a skilled and specially trained surgeon, hardly more dangerous than that for the removal of a kidney. Partial or total lobectomy is increasingly practised for such conditions as persistent abscess of the lung, for persistence of the bronchiectatic cavity, and for the removal of an early carcinoma. The results are most satisfactory; and one feels that in chest surgery lies the refutation of the statement by Lord Moynihan to which I referred at the opening of this lecture.

So far, unfortunately, the œsophagus has largely defeated the surgeon. I believe that in the history of surgery only three operations for the removal of cancer of the gullet and for its reconstruction have been successful. It was my privilege to be present at an extremely gallant and skilful attempt in this direction by Mr. Gordon Taylor of the Middlesex Hospital, which would undoubtedly have added to the number of successes had not that dreaded complication, pneumonia, supervened on the 10th day.

As regards surgery of the vascular system, the successful surgical treatment of aneurysm has long been in vogue in America, and to a lesser extent in Europe. A recent life-saving advance in the surgery of the arteries has occurred in the localization of embolism of the main arteries, and the removal of the clot before gangrene has had time to set in in the parts supplied. This operation has been performed, with notable success and increasing frequency, in cases of embolism of the main vessels of the limbs (usually at the elbow or behind the knee).

The surgery of the autonomic nervous system has proved disappointing. Some years ago it

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MANAGEMENT OF HEAD INJURY CASES IN RURAL PRACTICE

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The medico-legal case

THE rural practitioner generally feels helpless when a case of head injury arrives. He should realize that he can do quite a lot for the patient and often the life of the latter will depend on his careful judgment and management of the case. Serious operative treatment gives good results only in expert hands, in specially equipped hospitals, otherwise the treatment is more or less the same for every practitioner and dispensary, and therefore the rural practitioner is not very unfavourably handicapped in the matter.

Before going into the treatment, I will discuss one or two medico-legal points which often confuse the rural practitioner.

In rural practice the injury is usually the result of a fight. Therefore to assess the degree of damage, the medical officer must examine every case very thoroughly before giving a certificate. Generally the injured person will feign to be much more seriously ill than he really is, and so the practitioner must depend more on physical signs than symptoms and in very few conditions is he in a position to gauge the exact nature and degree of the lesion as in head injury, from the physical signs.

Recently I saw a case which was diagnosed as a 'simple' injury by a medical officer. The patient walked into the dispensary, was quite conscious, and more or less normal except for a lacerated wound in the head and a black eye, so the doctor did not examine the case as thoroughly as he would have done otherwise. On further examination it was revealed that he had hæmoptysis, unequal and sluggish pupils, pulse 64, and the cerebro-spinal fluid (on lumbar puncture) was mixed with blood. He obviously relied more on the symptoms, but after full examination there was no doubt that it was a case of 'grievous hurt' if not a dangerous injury.

In some cases the patient will try to belittle the seriousness of the injury for some reason or other. Generally, there is some motive behind it and unless the doctor makes a careful examination, he may be involved in serious trouble. In one case where a person was very badly beaten, the doctor did not report the matter to the police, as he did not consider the case to be serious enough. The injured person also requested him not to report it to the police. The motive of the patient is difficult to understand in such a case. It may be that he wanted to take the revenge himself and a police record would have gone against him in that case. However, the person died on the second night after the injury, and in his judgment the judge passed an injunction on the conduct of the doctor. The doctor's statement was that he did not consider the case to be serious enough. In my opinion he can only be blamed if he did not make a thorough examination, which he stated he did. So in these cases it will be wise for rural practitioners to record the negative evidence as well in the case sheet, at least for his own protection.

From these two examples it is evident that no reliance can be placed on the patient's statement or appearance. The patient in an average medico-legal case will try to hoodwink the doctor by feigning to be more seriously ill than he really is and the attending physician must rely on the actual physical signs present and must record them, not only for evidence but also for assessing the progress and guidance

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was considered that in the division of the post-ganglionic fibres of autonomic nerves supplying blood vessels, lay the successful treatment of the spastic conditions of the arteries, of the limb muscles, or of senile gangrene from arteriosclerosis. These fibres, which are constrictor in function, being paralysed it was considered that passive dilatation of the arteries would overcome or mitigate the condition. The operation is one of considerable technical difficulty; and its results in the main are not very superior to the simpler operation of the division of these fibres in the outer coats of the arteries concerned. In other words, lumbar sympathectomy has few, if any, ultimate advantages over peri-arterial sympathectomy, and, as such, is receding into our increasing category of 'operative indiscretions'. In two conditions, however, the surgery of the sympathetic nervous system is still not only justifiable, but successful. In the treatment of that rare disease of childhood, Hirschsprung's disease or megacolon, the division of the post-ganglionic fibres running along the course of the inferior mesenteric artery and supplying the constrictor muscles of the large intestine is brilliantly successful. The other condition in which sympathetic surgery is attended with satisfactory results is the excision of the pre-sacral plexus in cases of inoperable carcinoma of the uterus, prostate, or rectum, where this operation is followed by a marked relief of the agonizing pains which occur in the later stages of these fatal diseases.

Conclusion.—And that brings to end this very incomplete survey of some of the recent advances in surgery. I shall in conclusion quote the summary of the subject by one of the greatest living surgeons in the English-speaking world—Sir David Wilkie of Edinburgh:

'The surgeon requires an ever-broadening basis of education if his practice is to keep pace with the advances and assimilate the fruits of medical science. The gap between medicine and surgery is narrowing and the operating physician is coming into his own'.

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for further treatment. For this reason a record of negative findings is no less important than positive ones.

Classification of head injuries.—Injury of the head may cause the following lesions, either singly or in combination :—

1. Simple scalp wound.
2. Simple fracture of vault.
3. Fracture of the base.
4. Concussion.
5. Cerebral compression.
6. Cerebral laceration.

Investigation of a case of head injury

As soon as a case of head injury arrives, an attempt must be made to find out the exact nature and degree of damage sustained by the skull and its contents.

I. Preliminary examination

1. Obtain a careful history.

The exact nature of the fall or violence must be enquired into and the sequence of events that followed immediately subsequent to the injury should be noted. The period of unconsciousness following the injury is important; whether there was the temporary disturbance of slight concussion, a brief loss of consciousness followed by rapid return to consciousness; or deep unconsciousness of a severe concussion; or yet again the consciousness which is retained for some time after the accident, but presently followed by a state of stupor. The third denotes cerebral compression.

2. Is shock present, and if so to what degree ?

Shock is an inevitable accompaniment of concussion and actually there is no clear line of distinction between the two. For the moment, the occurrence of shock is not without advantage, for on account of the associated lowering of intra-cranial pressure, through reduction of general blood pressure, it affords temporarily a safeguard against bleeding immediately after the accident. So although the shock should be treated, none of the intensive stimulating methods should be employed.

3. Examination of the local part.

The wound in the scalp and the amount of damage to the skull are noted. If there is any depression, its nature and degree are also noted.

4. The whole body should then be carefully examined to find out if any other injury is present.

II. Detailed examination to assess the degree of cerebral damage

This must be recorded.

1. Is the patient unconscious ?

When the patient is unconscious, begin the investigation by estimating the depth of unconsciousness. This is a reliable index of the degree of intra-cranial damage and provides a standard by which we can contrast further improvement or deterioration. Four tests are applied in the following order :—

(*i*) A simple question such as 'What is your name', spoken in the ordinary tone of voice.

(*ii*) An imperative question spoken loudly close to the ear as 'Raise your hand' or 'left foot'.

(*iii*) Induction of a painful stimulus by pressing the finger nail against the supra-orbital notch.

(*iv*) Testing the corneal reflex.

Response to the first indicates comparatively slight concussion, while failure to react to the last shows the deepest degree of unconsciousness compatible with life.

2. Pulse.

Quick pulse of small volume is the usual accompaniment of concussion, but in the absence of complications, it soon returns to normal.

A slowing pulse rate accompanied by increased volume is a hint that compression is developing.

A quick pulse rate maintained at high speed and yet showing increased volume is an indication that some degree of cerebral irritation without localized compression exists.

3. Respiration.

Changes in respiration are less constant, but they too are important.

In concussion, respiration is slow and shallow. Irregularity of respiration and particularly Cheyne-Stokes' breathing indicates increased intra-cranial pressure.

A much quickened respiration points to serious cerebral laceration, generally of a diffuse character.

In advanced cerebral compression there is irregular stertorous breathing which indicates increasing bulbar compression and failure of the vital nuclei in the medulla.

4. Pupil.

As a general rule, pupils are moderately contracted and react sluggishly to light.

Inequality or asymmetry of the pupils indicates cerebral lesion and any further change in them will indicate that the lesion is still progressing. Thus inequality in the earlier stages is due to contraction of the pupil on the same side as the lesion (due to irritation), while on further compression, it is dilated on the same side as the lesion and contracted on the opposite side, and on still further compression both are dilated.

If one pupil is widely dilated and fails to react to light, the other presenting a normal appearance and retaining light reaction and this is noted comparatively suddenly in the progress of the case, one or other of two explanations is likely, a pontine hæmorrhage or œdema, or cerebral compression developing on the same side as the dilated pupil. The latter is of significance in the recognition of compression syndrome.

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5. Temperature.

Assuming that extra-cerebral causes have been excluded, a rising temperature means that there is some degree of cerebral damage.

Uncomplicated concussion does not exhibit pyrexia.

Few individual features are more suggestive than pyrexia, and in general it may be stated that the earlier the manifestation and the more intense the pyrexia, the more serious the cerebral damage.

6. Bleeding from the ear, nose, or throat.

If blood is escaping from the ear, its character should be noted; if the consistency is more watery than normal or coagulation is delayed, the probability is that cerebro-spinal fluid is mixed with it.

7. Blood pressure.

This must be recorded at two-hourly intervals for 24 hours.

Immediately after the injury, the blood pressure falls and as recovery advances, it rises. If it does so gradually, and after rising a few points above normal readjusts itself to average figure, prognosis is good.

If after the preliminary fall, it rises to a high level and is maintained, it indicates increased intra-cranial pressure.

On the other hand, in very severe injuries, as associated with extensive fractures of the skull, the blood pressure may remain low for the entire period of the illness.

8. Paralysis, twitching and convulsion.

Any evidence of twitching is noted, and the limbs are moved in various positions in order to ascertain if there is any flaccidity or spasticity.

9. Escape of cerebro-spinal fluid from the wound or ear.

10. Reflexes.

The tendon, plantar and abdominal reflexes are examined, but their evidence is not particularly trustworthy in head injury.

III. Clinical features of cerebral damage

A. Concussion.
B. Compression.
C. Laceration.

A. Concussion

The clinical appearance resembles that of surgical shock with the addition of disturbance of consciousness in a varying degree. The patient may be unconscious to the first or second degree, pulse quick and of reduced volume, respiration quick and shallow, blood pressure reduced, temperature subnormal, muscles flaccid, appreciation of pain diminished, skin pale and surface temperature lowered.

B. Compression

1. Due to cerebral œdema. It is due to the local œdema which follows on every injury of the brain. After about 24 to 48 hours, the patient passes into an exaggerated state of reaction, he lies curled up in bed, face buried under the bed clothes and resists all forms of interference, specially exposure to light, and complains of severe headache. Temperature is raised, face flushed, pulse full and slow.

2. Due to intra-cranial hæmorrhage.

Remembering that concussion almost always follows immediately after a severe head injury it is obvious that a latent period must follow before the symptoms of intra-cranial hæmorrhage can develop. In extra-dural hæmorrhage the symptoms may appear in a few hours, but in sub-dural hæmorrhage it may take several days.

In extra-dural hæmorrhage a period of remission generally intervenes between the concussion which immediately follows the injury and the compression to which the hæmorrhage gives rise. In this period the patient may recover consciousness and there may be a lucid interval of perhaps a few hours. During this period the blood pressure is steadily rising, the patient begins to complain of increasing headache, then he becomes irritable and later drowsy and finally comatose with stertorous breathing, flushed face, and slow, full pulse. There may be hemiplegia on the opposite side of the body with rigidity and possibly Jacksonian convulsions in the early stages. Later on, rigidity may appear on the same side as the lesion from generalized compression and, unless its true nature is recognized, it may lead to erroneous diagnosis of the side of hæmorrhage. Pupillary changes have already been described. Still later, the medullary centres become paralysed, the pulse becomes rapid, weak and irregular and the respirations uncertain and gasping; these indicate that the terminal stage is fast approaching.

In the more serious cases the stupor of concussion passes almost imperceptibly into unconsciousness of compression, and unless a very careful watch is kept, the opportunity of affording relief may pass before the condition is diagnosed.

The other and the most important sign of increased intra-cranial pressure is the increased tension of the cerebro-spinal fluid. So, briefly, the evidence of compression is

(*i*) The effects of general increased intra-cranial pressure as evidenced by pulse etc.
(*ii*) Effects of local corticai pressure as shown by convulsions or paralysis.
(*iii*) The rate at which the cerebro-spinal fluid comes out on lumbar puncture.

Possible later effects of cerebral compression

1. A delayed compression œdema, generally associated with cerebral laceration.

2. Meningo-encephalitis—usually due infection.

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IV. Dangers of fracture of the base of skull

The gravity of fractures of the base in contrast to those of the vault is mainly due to the relation of the dura to the bone; in the former the dura is invariably torn; whereas in the case of the vault the dura separates with the greatest ease and may escape being torn.

Anterior fossa. There is no immediate danger, but the injury is liable to delayed sepsis owing to its communication with the nasal cavity.

Middle fossa. The dangers are both immediate and remote, because an extensive hæmorrhage very often accompanies the fracture and because the line of it may involve the sella turcica and endanger the pituitary or its stalk; remote, because the communication with the ear may induce sepsis.

Posterior fossa. Fracture of this fossa causes the most immediate concern because of its proximity of the vital area of the medulla, but on the other hand they are in a large measure free from the risks of secondary infection.

Treatment

I. General

Undress the patient with the minimum disturbance.

Put him to bed with the head on one side without a pillow.

Ice bag or cold compress should be applied.

Concussion is tantamount to shock and the treatment should be carried out accordingly. Hot-water bottles, fluids preferably by mouth, otherwise subcutaneously or rectally. Intravenous methods are inadvisable because a sudden rise of blood pressure may initiate bleeding or may produce cerebral œdema.

Restlessness. Put the patient in a dark quiet room. Restlessness may indicate the onset of compression. Morphine should not be given. Bromides and chloral gr. 15 to 20 each should be given. If the patient is unable to swallow, paraldehyde, one dram per stone of body-weight, made up with mucilage of acacia in a proportion of two parts to one of mucilage, may be given per rectum. If this is not effective, hyoscine should be given.

II. Local

Fractures involving the vault.—It is better to shave the head or cut the hair as short as possible. This will enable better examination and the ice cap or cold compress will be more effective. Moreover the part will be kept ready for immediate operation if necessary.

Simple fissured fracture. This should be left alone.

Compound fissured fracture. The wound should be cleaned, and necessary treatment for the general condition adopted. Watch should be kept for symptoms of compression.

Depressed fracture. If it is pressing on the brain, it must be operated on and the pressure relieved. Otherwise it should be left alone.

Fractures involving the base.—The same line of treatment as already indicated should be undertaken. All obvious sources of infection must be avoided. Put a few drops of 5 per cent argyrol into the auditory meatus and if possible spray the nose with the same solution.

Restlessness is usual and should be treated at an early stage with judicious sedatives.

The pulse, respiration, temperature and blood pressure should be recorded every two hours and the bladder should be watched.

Treatment of compression.—Compression due to extra-dural hæmorrhage may appear at any stage but if it be due to cerebral œdema it generally manifests itself after 24 hours by deepening unconsciousness and alteration of the character and frequency of the pulse, blood pressure, respiration and temperature as described above.

When symptoms of compression appear the following treatment is advised :—

Lumbar puncture. If there is moderate rise of pressure, the fluid should be drained until normal pressure is attained.

If there is excessive rise of pressure, hypertonic therapy is indicated. If the patient is able to swallow, 2 drachms of magnesium sulphate in 2 ounces of water are given and thereafter 1 drachm of the salt in 2 ounces of water is repeated every two hours until a watery motion is evacuated. If swallowing is impossible, 3 ounces of magnesium sulphate in 6 ounces of water are given as an enema. The injections may be repeated if necessary. Hypertonic solution such as 50 per cent glucose or 30 per cent saline, injected intravenously, is powerful in lowering the intra-cranial pressure. Moreover, a hypertonic solution of glucose and saline will combat the shock very well. If the symptoms reappear, treatment should be repeated. This is all that should be done in a small dispensary. In *tehsil* headquarters dispensaries further treatment as detailed below may be carried out.

If compression persists or increases in spite of the above treatment, it is not simple general cerebral œdema. It is more likely to be hæmorrhage which is slowly but insidiously progressing and one is forced to decide whether to operate or not. If operation is decided, it must be done as soon as possible and it cannot be expected that a local decompression will afford relief to a brain that is already water-logged.

Technique of operation

Local anæsthetic, 1 per cent novocaine with adrenaline, is used. The infiltration is carried out along a line which extends vertically upwards from the zygoma, one inch in front of the external auditory meatus for a distance of 3 to 4 inches.

The superficial tissues are divided, temporal fascia is incised, fibres of the temporal muscle

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are split and retracted and the bone of the temporal fossa is exposed. The bone is perforated with a trephine or bur at a point about two finger-breadths above the zygoma and with a pair of nibbling forceps the vault is cut away until an aperture 2½ inches in diameter is made. If there is a clot, it should be removed and most likely the middle meningeal artery will be found ruptured and if so it should be ligatured.

Failing this, the dura should be opened in a cruciform manner, avoiding the dural vessels. If they have to be divided, they should be picked up with a fine round needle and stitched and each ligatured individually.

The dural flaps are widely separated, the split in the temporal muscle is restored by a few interrupted catgut sutures, temporal fascia is united with a continuous catgut suture and th edges are united with silkworm gut or horse hai

If there are still signs of further compressio alimentary dehydration as already indicate should be continued. Failing that simil decompression operation may be done on th opposite side.

After-treatment

The patient should be kept in bed for 3 to weeks, on a low diet with abundant fluids. Ha an ounce of magnesium sulphate solution shou be given every morning. Ten grains of pota sium bromide should be given every day. I the patient is suffering from insomnia, 2 gr. luminal or 7½ gr. of medinal, or 5 gr. of soner may be given.

A Mirror of Hospital Practice

AN INTERESTING CASE OF SUB-TERTIAN MALARIA

By A. K. GHOSE, L.M.F., L.T.M.
Medical Officer, Ambari Tea Estate (Dooars), Jalpaiguri

IT was reported to me that a boy, aged about 10 years, of weak constitution, with slight irregular fever for the past two or three days, fell down unconscious. I lost no time in going to see the boy and found him in the following condition :—

16th June, 1937. Completely unconscious with violent spasms and struggling.
Spasm of the jaw muscles.
Rigidity of back and neck muscles. Pupils dilated.
Spleen slightly palpable under the costal arch.
Temperature—100.4°F.
Sub-tertian malaria was suspected. Blood films were taken and quinine bihydrochloride (gr. 5) was injected intramuscularly without delay.
Blood examination—Malignant tertian rings ++++. Growing schizonts +.
Evening temperature—99.2°F. Condition unchanged.
Quinine injection repeated.
Blood examination—Rings and some growing schizonts.
17th June. Morning temperature—98.6°F. Pulse and respiration normal.
No spasms or strugglings. He could now take fluid diet.
Quinine injection (gr. 5) repeated.
Evening temperature—99.4°F. Condition much better.
One tablet of quinine bihydrochloride (gr. 5) was swallowed.
Blood films—Degenerated rings + +.
18th June. Morning temperature—99°F.
Evening temperature—99.6°F.
Alkaline mixture two tablets of quinine bihydrochloride (gr. 10) were ordered daily. No other complications appeared and he took solid food (rice) and talked distinctly.
Blood examination—Rings (degenerated) a few only.
19th June. Temperature normal.
Blood showed no parasites. He made an uninterrupted recovery.

Discussion

It is recognized by all the leading authorities (Stitt, Manson, Knowles) that the schizogony cycle of sub-tertian parasites is almost always confined to the internal organs and only rarely in heavy infections—usually in fatal cases (Knowles)—does this stage appear in the peripheral blood.

The point of interest of the case under report is that, though there was heavy infection, it was very easily controlled by administration of quinine in moderate doses given intramuscularly. The intravenous route was not adopted in consideration of the age and weak state of the patient.

Conclusion

I sent the blood smears to the protozoologist department of the Calcutta School of Tropical Medicine to corroborate my findings. Dr. D. Gupta very kindly examined the blood slides and confirmed my results, and I take this opportunity of expressing my gratitude to him. He remarked 'It is incorrect to believe that the cases showing the schizonts of *P. falciparum* in the peripheral blood always prove fatal. Of course, these are bad cases'.

I examined his blood daily for 11 days for crescents but without any success. After this period he refused to be subjected to more pin pricking, so I could not follow up the case further.

APPENDICITIS IN A CASE OF TRANSPOSITION OF VISCERA

By R. D. MACRAE
CAPTAIN, I.M.S.
Civil Hospital, Mercara, Coorg

A YOUNG male was admitted into hospital with pain in the right side of the chest, cough, occasional fever and shivering. On examination the patient was found

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to be well nourished. The apex beat of the heart was in the fifth intercostal space on the right side, two and a half inches from the mid-sternal line. The temperature was normal. The spleen and liver were not palpable; no malarial parasites were found in blood films. There was diminished vocal resonance with impaired breath sounds over the lower lobe of the right lung. In the left iliac fossa hyperæsthesia was elicited over Sherren's skin triangle, with deep tenderness over an area corresponding normally to the lower six inches of the descending colon. This was assumed to be due to an inflamed and distended vermiform appendix, transposed to the left side. Rovsing's sign, elicited by pressure over the right iliac fossa, was found to be positive.

The condition of the chest responded well to rest, counter-irritants, and stimulating expectorant mixtures. After a few daily enemata the abdominal signs disappeared, except for the tenderness. No ova or protozoa were found in the stool; and the urine was normal. Roentgenological investigation was not possible. Rectal examination revealed nothing abnormal.

The abdomen was opened by the left paramedian incision under evipan sodium and inhalation anæsthesia; the appendix was found inflamed and adherent to the cæcum near its tip and it contained a small fæcal concretion. It was removed, and the abdomen explored. All organs were transposed. The spleen, lying in the right hypochondrium, was slightly enlarged. The abdominal aorta divided at the level of the third lumbar vertebra and the iliac arteries ran downwards, almost parallel to each other as far as the pelvic brim. The abdomen was closed, without drainage, and the patient made an uneventful recovery.

TREATMENT OF GANGLION*

By A. K. DUTT GUPTA, M.B., D.T.M.
Resident Surgeon, Medical College Hospitals, Calcutta

A GANGLION is a cystic swelling usually found in the region of the wrist or the ankle. The origin of a ganglion may be either sudden, after a trauma, or insidious and slow. The ætiology is not definitely known.

The usual symptoms are slight weakness and some pain; the unsightly condition also worries the patient. The swelling does not move on the movement of the tendons but it may be made more apparent when they are stretched. The treatment may be either non-operative or radical surgical operation.

Many authorities recommend a preliminary trial with conservative measures at first.

(*a*) The cyst is ruptured by gradual pressure or by a sudden blow. It is painful and there is recurrence later.

(*b*) The contents are aspirated and some irritant injected such as iodine, carbolic, and quinine urethane. Mercer, quoting Gunther, describes the injection of collodion into the ganglion and Hamilton Bailey also advocates this form of treatment.

The surgical treatment consists of a complete removal of the whole of the cyst wall, otherwise recurrence takes place. A general anæsthetic is necessary; often the cyst has a broad base and very often communicates with a joint cavity which is opened by the operative procedure. Even then it is very difficult to remove the whole wall without causing injury to the tendons or capsule of the joint. Strict asepsis is essential.

In view of the facts that operative treatment is not always possible in the out-patient department and also that preliminary conservative treatment is advocated by many authorities, the following plan of treatment was adopted on a series of unselected cases with encouraging results. The limb was put in a plaster-of-Paris casing and kept fixed in the position of rest for four to six weeks and a short course of ultra-violet rays was applied. In every case, the swelling had entirely disappeared, when the plaster was opened. It is of course very difficult to make the otherwise healthy patients keep the plaster on for the desired length of time without soiling or softening it with water.

The two following case reports are typical of the series :—

Case 1.—A young athlete had a ganglion on the dorsum of the hand, the size of a very large marble, for more than four months. It had incapacitated him from active work. *X*-ray examination showed no bone or joint defect. After four weeks' immobilization in plaster in gentle dorsi-flexion, the swelling had entirely disappeared. A short course of ultra-violet rays was administered. He was seen ten months afterwards and there was no sign of recurrence of the ganglion. He can now do any work, including weight lifting.

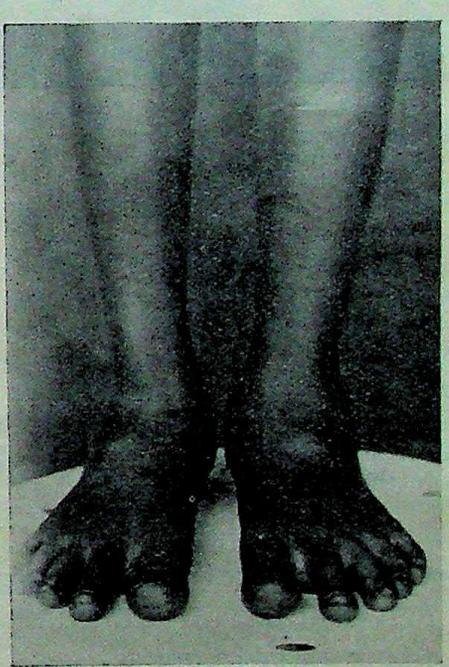

Fig. 1.—Bilateral ganglion before treatment.

Case 2.—A girl, 12 years of age, had a ganglion on the dorsum of each foot. *X*-ray examination did not reveal any bone or joint disease. The left foot, which had the bigger ganglion, was treated and the right foot

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left untreated as control. Figure 1 shows the condition before treatment and figure 2 shows the feet after treatment. It will be noted that the ganglion on the left foot has completely disappeared.

Cases that could be followed up have shown no recurrence in a year.

This method may be tried with advantage on all cases before a surgical operation is undertaken. It will be specially useful in patients who are unwilling or are unsuitable for operation.

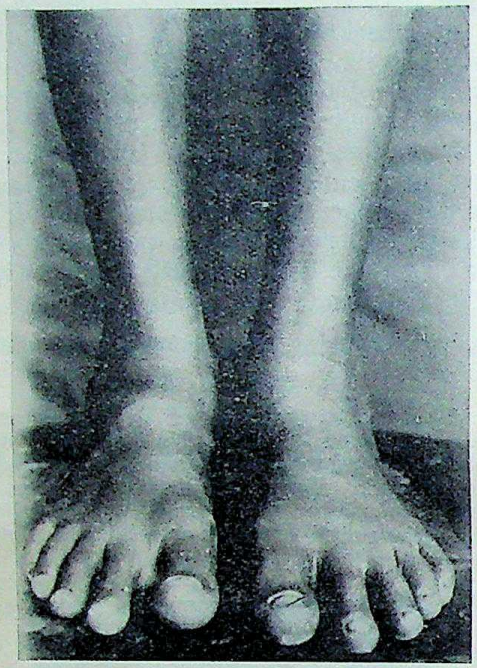


Fig. 2.—After removal of plaster. Left foot shows disappearance of ganglion, compared to right side—untreated (same case).

It has advantages over the injection method that the latter is painful, may give rise to inflammation with subsequent fibrosis, and if unsuccessful the subsequent operation is made more difficult.

I wish to thank the house surgeons of the surgical out-patients department who took much interest in the work.

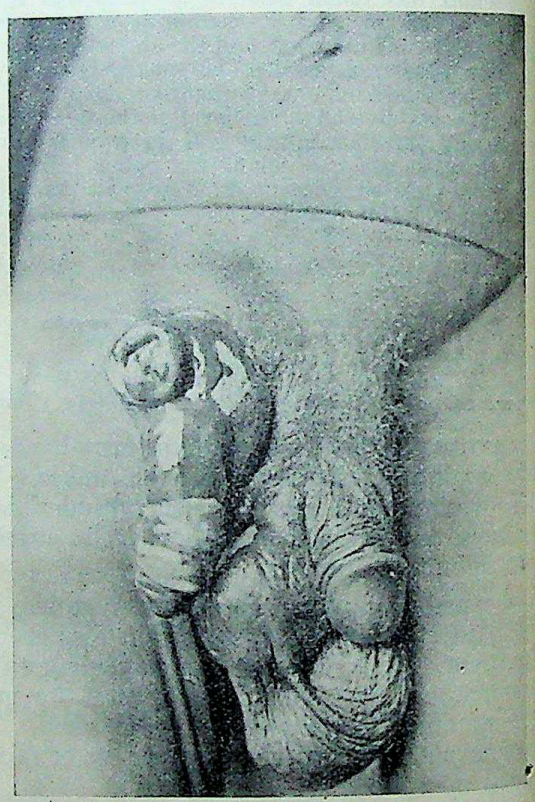
A REMARKABLE NATURAL CURE OF STRANGULATED HERNIA*

By A. K. DUTT GUPTA, M.B., D.T.M.
Resident Surgeon, Medical College Hospitals, Calcutta

NATURAL relief of a strangulated hernia by the formation of a fæcal fistula is not altogether unknown especially in neglected femoral hernia. Prolapse of the gut through the fistula is very rarely seen and the case to be described is still more unusual as there was a double prolapse, one of the ileum and the other of the ascending colon through a fistula in the cæcum.

The patient, over 50 years of age, had severe pain and swelling in the right inguinal region, about three weeks before coming to the hospital. The pain and vomiting lasted for two days after which the swelling burst with discharge of fæcal matter and he was relieved. After about a week he found two portions of gut protruding through an opening in the skin.

When he came to hospital, he was very weak and emaciated from constant discharge of fluid fæces from the small intestine. On examination, a red smooth protrusion about five inches long with a slight concavity towards the left and a small central hole at the end was found dangling near the pubis. Another globular swelling, greater in diameter but shorter in length, was found on the right side of the first protrusion. Both of these were œdematous with small multiple ulcers and sloughs. It presented the appearance of a decorticated penis and scrotum. The central opening looked like the external urethral orifice and as the opening of the other swelling was pointing posteriorly it was not seen.



After a few days of preparation the man was operated upon. The prolapsed portions of gut were pushed into the abdomen through the opening. Even then it was not certain that the rent was in the cæcum. It was suspected that a loop of gut had become gangrenous and fallen off and the two prolapsed portions were the ends of the gut left by separation of the gangrenous loop. The mucous membrane being ulcerated, did not give the appearances typical of large and small intestines. After enlarging the opening and careful dissection the damaged portion of the gut was pulled out and was found to be the cæcum. The appendix was present posterior to the rent. The interior of the cæcum was extensively ulcerated. The lower end of the ileum and proximal part of the ascending colon were mobilized sufficiently, the cæcum was excised and an end to end anastomosis was done between the ileum and the ascending colon without opening up the general peritoneal cavity, which was shut off by adhesions. The patient made a remarkable and uneventful recovery and left hospital a month after the operation.

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Indian Medical Gazette

JANUARY

THE RESEARCH WORKERS' CONFERENCE AND MEDICAL RESEARCH IN INDIA

THE Indian Research Fund Association was founded in 1911, and its comparatively small capital and annual income of five lakhs was administered by a governing body and an expert advisory committee. It was not possible to bring into being a large body of expert investigators at a moment's notice, and although an immediate expansion of research activities in India followed the founding of the association, the governing body decided to conserve the funds of the association as much as possible during the period of training of an adequate personnel, rather than squander them on amateur schemes of research, and eventually to build a central research institution which would be the kinetic nucleus, so to speak, of medical research in India. The development of this scheme was held up by the war, but the funds of the association continued to accumulate. Meanwhile, however, the conditions which had produced stasis at the centre had stimulated activity at the periphery and, both in Bombay and Calcutta, there were schemes for furthering medical research and for founding schools of tropical medicine in each of India's rival commercial centres. Largely as a result of the strong material support from the commercial community, in particular the tea, jute and mining associations, and of the dynamic personality of Sir Leonard Rogers, the government of Bengal decided to go on with their project, whereas the government of Bombay dropped theirs.

The gods help those who help themselves, and the Calcutta school received a considerable grant from the Indian Research Fund Association for a number of years—and they are still receiving a proportion of this grant—but the idea of a large central research institute was still visualized and slowly became more concrete. Then in 1923 the Inchcape axe fell and the whole of the annual government contribution of Rs. 5 lakhs was discontinued.

There had always been two schools of thought regarding the central research institute, one favoured the concentration of both funds and personnel in this central institute and the other the strengthening of the already active provincial institutions, the School of Tropical Medicine in Calcutta, the Haffkine Institute (later named) in Bombay, the King Institute in Madras, etc. This financial crisis had the effect of widening the gap between the two schools of thought; the centripetal school considered that a halt should be called in medical research in India until times improved so that the capital fund might be conserved, whereas the centrifugal school considered that a steady development of a research personnel was far more important than bricks and mortar and that, even if it meant eating into capital to some extent, this would be far better than stopping the research schemes already in progress and dispersing trained personnel.

It was at this point that Sir John Megaw—at that time Director of the Calcutta School of Tropical Medicine—made the suggestion that the opinion of medical research workers in India as a whole, and not simply of the one or two senior members attached to the central research laboratory at Kasauli, should be ascertained. This suggestion was taken up readily by the Director-General, who invited all provinces to send delegates, and the first All-India Conference of Medical Research Workers was held in the autumn of 1923 at the School of Tropical Medicine in Calcutta.

The conference had no executive power—and never has had to this day—but here the whole position was discussed and the weight of opinion was so much in favour of continuing the research programme, even at the sacrifice of capital, that this policy was recommended by the scientific advisory board and adopted by the governing body of the fund. Fortunately, the financial atmosphere improved very quickly and soon the grant was restored, in part at first and finally altogether.

This first conference, designed as a 'business' meeting to discuss ways and means, took on a valuable scientific application as well, gave research workers from different parts of India an opportunity to express and exchange their ideas on the various research problems, mitigated the dangers of isolation, for example the staleness that engenders despair or, conversely, self-complacency, and altogether was such a success that it was decided to make it an annual event; in the intervening fourteen years there have been fourteen conferences.

During these fourteen years the conference has undergone certain changes: one development has been that of natural growth, both in the number of delegates which were originally about thirty and have now risen to over a hundred, and in the amount of business transacted, which despite the fact that much of this is done by the sub-committees that have been formed for all the most important subjects, *e.g.*, malaria, nutrition, cholera, tuberculosis, plague, leprosy, maternal mortality and rabies, it would never have been possible to finish in the week allotted for the conference but for the efficiency of a chairman who keeps speakers rigidly to the point and the continence of many of the delegates who

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maintain a silence despite the fact that they feel they may have something relevant to add to the discussion.

Another, more subtle change that the conference has undergone is perhaps best reflected in the change in its composition; the delegates at the first conference were with few exceptions the research workers themselves, but there has been from the early days an increasing tendency for senior administrative officers and directors of public health to attend, so that at the 15th conference these easily outnumbered the research workers themselves. This change is, we believe, again a reflection of a change in the general attitude towards medical research and indicates an increasing enthusiasm, not simply to carry out research—this always existed—but to put into practice the results of this research, both by those responsible for medical relief and those concerned with prevention of the spread of disease. This intrusion into their conference is certainly not resented by the research workers, as, if the director of public health gets valuable suggestions from the research worker, the latter gets indications as to the direction in which the work is most likely to be productive and he learns of medical problems of which he possibly did not know the existence. That is to say the tendency is not to treat the medical research worker as a peculiar person who works and thinks on a different plane and whose language differs from that of the ordinary medical man, but to meet and understand him and the work he is doing, and if possible apply it. The spirit of mutual understanding and co-operation must lead to the general advancement of medical science in India and would certainly not have been achieved so early had the research workers' conference never come into existence. It is, however, a question whether with the change in its character it should not also change its name and become the All-India Medical Research Conference.

It is not our intention to give a history of the conference and follow it through its fifteen meetings, nor to discuss the part it has played in the shelving of the expensive central research institute scheme, nor to trace in detail its influence on the development of medical research in India, but simply to remind our readers of the origin and functions of this conference, it has, as we have already said, no executive power but its opinions have always carried weight and the governing body has never taken any action which could be said to be directly opposed to the views expressed by the majority amongst the members; and on two occasions at least complete reversals of policy have been brought about by strong resolutions sent forward by this conference.

This year for the first time the conference met at the Imperial capital and His Excellency the Viceroy, Lord Linlithgow, did the conference the honour of himself opening the first session. His Excellency has always taken a very keen inte in medical research and was for some ye before he came to India chairman of the Medi Research Council of His Majesty's Privy Co cil: his opening address is printed elsewhere this number. His interest will do much establish even more firmly the importance of annual conference and to stimulate a wi interest in medical research in India.

MEDICAL STATISTICS

We maintain that the intelligence of physician and particularly of the physic engaged in clinical research is above the aver of that of the community from which he com quite often, nevertheless, when he is presen with the simplest statistical problem, his br appears to become completely paralysed he is so self-conscious of the limitations of knowledge that not only does he fail to un stand his subject, but he won't even try to so, and seems to be as unable to apply native intelligence as would an aborig tribesman in similar circumstances.

This is partly the fault of the physician to be more precise of the education syste under which he has been taught in his p medical and medical student days and wh have not taught him to apply his comm sense, and partly the fault of the statistici who has invented a language and even a scr of his own, so that the average physician a statistical conference would find himself completely lost as would a Japanese peasan he were suddenly planted in Piccadilly Cir

The language of the statistician is not, more than that of the physician, invented, many people seem to suppose, in order to c fuse the outsider—or, as the cynic would say all language, in order to conceal thoughts—b to facilitate, and above all to abbreviate, co munication between experts. Nevertheless, does confuse the outsider, and consequen most books on statistical methods are qu incomprehensible to him.

This is a very great pity because the need a sound knowledge of statistical methods apparent in practically every number of ev medical journal that one picks up. Consul tion with a statistician is often very helpful, if the research worker postpones this until af he has produced his results he may meet w disappointment, as often he will be told th the conception of his investigation and methods of collecting data are fundamenta wrong and that no amount of statistical analy will turn his pig's ear into a silk purse. Ev if he consults the statistician at the beginni of his enquiry he may later have to change methods to meet circumstances. It is therefo almost essential that he himself should hav substantial grounding of knowledge of statisti

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methods. A number of excellent books have been written with the object of teaching the elements of statistical methods to the practical investigator and of facilitating the liaison between him and the statistician, but none, in our opinion, has been quite elementary enough. For this reason, we consider that from the point of view of medical research work, the most valuable series of articles to appear in a medical journal recently have been those by Dr. Bradford Hill on medical statistics, which were published each week in the *Lancet* during the first few months of last year. We were therefore particularly pleased to receive for review the volume in which these articles have been reprinted*.

This writer does seem to have achieved what others have failed to achieve and brought himself down to the level of comprehension of the statistically-innocent practical research worker, without exactly insulting his intelligence. We commend this little book to all medical research workers and particularly to would-be contributors to this journal.

* *Principles of Medical Statistics.* By A. Bradford Hill, D.SC., PH.D., 1937. The *Lancet* Limited (7, Adam Street, Adelphi), London. Pp. 171. Illustrated. Price 6s.

Special Articles

THE CHEMOTHERAPY OF STREPTOCOCCAL INFECTIONS

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and

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CHEMOTHERAPY is usually regarded as a treatment of disease by chemical substances which by biological test have previously been proved to be relatively much more toxic to pathogenic organisms than to human or any other animal being. From clinical observations it is now known that protozoal diseases, such as malaria and syphilis, readily yield to certain specific chemical remedies while no bacterial infection in human beings can be checked *in vivo* by any such substance. Recent researches have, however, brought to light the possibility of combating streptococcal infections by means of chemical compounds having a selective action and accordingly the former belief that bacteria are more resistant than the protozoa can no longer be upheld.

History

It may be pointed out that chemotherapeutic research requires a close co-operation between clinicians, biologists and chemists. In the case under discussion it was already known that the different cocci are responsible for various diseases like tonsillitis, erysipelas, gonorrhœa, pneumonia, scarlet fever, puerperal sepsis, etc. The organisms again can be easily collected, cultured, grouped and classified. It is only the isolation of a number of chemically-related substances having bacteriostatic and bactericidal action in blood and tissues that has now led the chemists to tread on this new pasture. Of course, on the chemical side researches practically started from the discovery of Domagk (1935) that a red dye, the hydrochloride of 4-sulphamido-2:4-diamino azo-benzol (VII), had a specific action against hæmolytic streptococci. It was clinically tested by Klee and Römer (1935), Schreus (1935) and Levaditi and Vaisman (1935). As usual, once certain knowledge of the chemical constitution of a drug is obtained, other substances more-or-less closely related to it would be synthesized and tested for their chemotherapeutic properties. In this way the chemist might have to adopt a blind method and roam in darkness before he was fortunate enough to come upon a '606', '710' or '914'. In the present case it was very soon pointed out by Tréfouël *et al.* (1935) that the azo compounds which did not contain a sulphonamide group attached to one benzene nucleus were inactive, whereas the substituents in the other nucleus might be varied without influencing the protective power. They further noted that the diazo-linkage itself was not essential and that the parent compound p-aminobenzene-sulphonamide (VI) was equally therapeutically active—an observation since confirmed by Colebook and Kenny (1936). Colebrook *et al.* (1936) have further observed that p-amino-benzene-sulphonamide has a bacteriostatic and bactericidal action against a small number of hæmolytic streptococci in culture media and in blood, whereas the red dye, better known as prontosil-red, is inactive. On reduction, however, it affords an active substance indicating thereby that the prontosil may become altered in the system to give rise to the active substance sulphonamide. That reduction may be the factor in the activation of prontosil seems also reasonable from the fact that hæmolytic streptococci can, under certain conditions, bring about the reduction of some chemical substances. The proof (Fuller, 1937) that a considerable amount of sulphonamide is excreted when prontosil is given by mouth or injection, clearly demonstrates that the animal system is able to break down the dye to p-aminobenzene-sulphonamide which is then the actual active substance. These observations have resulted in the production by several firms

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of p-aminobenzene-sulphonamide under different names such as :

Prontosil album.....	from	Bayer
Sulphonamide P.....	„	British Drug Houses
„	„	Burroughs Wellcome
Colsulanyde.....	„	Crookes Laboratories
Streptocide.....	„	Evans, Lescher and Webb
Bi-Sulphonamide....	„	Bengal Immunity

All these compounds are believed to be very similar in composition but for its clinical use the compound must be chemically pure, melting correctly at 166 to 166.6°C. Here it may be said that the organic chemists are generally accused of working in the direction to increase the pages and volumes of *Beilstein Handbuch der organische chemie*. But this new chemotherapeutic compound was first synthesized in the year 1884 by a method which involves the action of sulphuric acid on aniline (I) at an elevated temperature, converting the resulting sulphanilic acid (II) to its sodium salt and reacting this with acetic anhydride to afford the p-acetyl amino derivative (III). This latter compound with phosphorus pentachloride gives rise to the product (IV) which on treatment with ammonia yields the acetyl derivative (V) and this on subsequent hydrolysis affords p-aminobenzene-sulphonamide (VI). The reactions are represented by the formulæ below :—

$NH_2.C_6H_5 \rightarrow$ (p) $NH_2.C_6H_4.SO_2.OH \rightarrow NH_2C_6H_4SO_2.ONa$
(I) (II)

$\rightarrow MeCONHC_6H_4SO_2ONa \rightarrow MeCONHC_6H_4.SO_2Cl$
(III) (IV)

$\rightarrow MeCO.NHC_6H_4SO_2NH_2 \rightarrow$ (p) $NH_2.C_6H_4SO_2NH_2$
(V) (VI)

$(NH_2)_2C_6H_4N = NC_6H_4SO_2NH_2(p')$ $MeCO.NHC_6H_4SH$
(VII) (VIII)

$NH_2C_6H_4SO_2NHR$ $NH_2C_6H_4SO_2C_6H_4NH_2$
(IX) (X)

Thus, a product obtained by the most common organic reactions is now being found to possess bactericidal property at a time when repeated failures with various antiseptics had led all to conclude that the disinfection of the blood stream in septicæmia would ever remain an impossibility.

Chemical constitution and therapeutic activity

The question now, naturally, arises whether this antistreptococcal action is the exclusive property of p-aminobenzene-sulphonamide. Fourneau *et al.* (1936) have shown that the alteration of the amino group to *ortho* or *meta* position, or replacement of the sulphonamide group by other groups results in loss of activity. Tréfouël *et al.* (1937) further pointed out that an additional substituent particularly in the *meta* position with respect to the sulphonamide group was unfavourable. The combination with/or replacement of the amino group again lowers the activity of the compound. Recently Gray *et al.* (1937) have, however, synthesized a few compounds—p-methoxy-benzylidene-p-aminobenzene-sulphonamide, p-dimethyl-aminobenzylidene-p-aminobenzene-sulphonamide—which are being claimed to be as active as pronto- in streptococcal infections in mice and are fro 2 to 16 times less toxic. But as all these com pounds might readily give rise to free p-amin benzene-sulphonamide, the efficacy of the co pounds themselves might be questioned. Anoth product, p-benzyl-aminobenzene-sulphonamid which does not contain a free 'p-amino' grou nor one which should readily yield free p-amin benzene-sulphonamide, is being considered to b less toxic but less effective than the latter co pound (Gray *et al.*, 1937). That the activit of p-acetyl-aminobenzene-sulphonamide (V) one-third of that of sulphonamide (Buttle *et a* 1936) clearly points to the necessity of th presence of a free 'p-amino' group. Th higher dosages often required in sulphonamid treatment might then be accounted for by i partial conversion (Marshall *et al.*, 1937) less active p-acetyl-aminobenzene-sulphonamid

Regarding the 'sulphonamide' part, it ma be said that an increase in its number in th benzene nucleus does not in any way increa the streptococcal activity (Buttle *et al.*, 1936 Replacement of the amido hydrogen by a phen radical (IX, R = Ph), however, does not alt the special characteristic of the product. O the contrary, its replacement by 8-quinoly 6-methoxy 8-quinolyl, or γ-diethyl-butyl whic are known to afford important therapeutic com pounds increases the toxicity of the compoun That the bactericidal property is not exclusive due to the presence of the sulphonamide grou ing, —SO_2 NH_2—, is again evident from th recent observations of Buttle and his co-work ers (Buttle *et al.*, 1937). They have found th 4, 4-diamino-diphenyl sulphone (X) is active i curing streptococcal infection in mice in doses about one-hundredth of those required wit p-aminobenzene-sulphonamide. It is, howeve 25 times as toxic as the latter compoun Similarly dinitro 4, 4-diphenyl sulphide, dinitr 4, 4-diphenyl disulphide, and 4, 4-diphen sulphone—none containing any sulphonamid grouping—have been found to be more activ than sulphonamide in experimental hæmol streptococcal infections (Fourneau *et al.*, 1937) These as well as the observation of Gley (1937) that p-acetyl-amino-thiophenol (VIII) possesse an antistreptococcal action, clearly indicate tha this specificity might be exerted by bodies con taining sulphur in one or other form. Of cours at present there is no knowing when thes investigations of the biologists and chemist would reveal an ideal drug for the treatment o bacterial infections.

Attention has also been directed towards th isolation of a soluble form of this importan drug (its solubility being only about 2 per cen at the body temperature). But under norma conditions the introduction by injection has n advantage over oral administration as a sub cutaneous injection of the drug does not lea to a higher blood concentration than when it i

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given by mouth. Even after intravenous injection a small fraction remains in the blood stream; obviously the sulphonamide passes readily from the blood into the tissue (Marshall *et al.*, 1937). Further an injection of a solution of the drug left over for a period of time may give rise to other toxic symptoms [*cf.* De and Basu (1937)]. The sulphonamide is rapidly (within about four hours) absorbed from the gastro-intestinal tract, enters practically all the body fluids including the saliva, pancreatic juice, bile and cerebrospinal fluid, and is excreted rapidly and almost entirely by the urinary tract, partly in unchanged form and partly as an acetyl derivative. The difficulty is that it is necessary to give large doses by the mouth. This is sometimes inconvenient or difficult and often may give rise to other troubles.

Toxicity and dosage

In *in vitro* experiments a small inoculum of streptococci in blood is destroyed by the amide even when present in so low a concentration as 1 in 18,000. Tests on mice have proved that the average lethal dose for animals of 20 gm. weight is about 150 mgm. (Whitby, 1937). This is several times the full effective dosage; our investigations (De and Basu, 1937) tend to show that 7.5 mgm. will protect mice against virulent streptococci. The patients have been found to tolerate 4 to 6 gm. (60 to 90 grains) of sulphonamide daily for as long as a month without any undesirable ill effect. The acute toxic dose of the drug for human beings is of the order $\frac{1}{2}$ to 1 lb., a dose very far away from the daily dosage of 3 to 4.5 gm. The dose in moderate cases is two 0.5 gm. ($7\frac{1}{2}$ grains) tablets three times daily. Maintaining a clinical improvement for 2 days one tablet of 0.5 gm. three times daily for 3 to 4 days would complete the treatment. In severe cases it is advisable to take three 0.5 gm. tablets three times a day and after an improvement the dose may be reduced to two tablets daily and maintained at this dose for a few days. In critical cases the treatment should be commenced with high doses, intramuscular [either with prontosil (2.5 per cent) or sulphonamide in normal saline] and oral therapy being combined. The dose of intramuscular injection may vary from 10 to 25 c.cm. daily. The dose for children should be calculated accordingly. It is advisable, however, that 3 to 6 drops of dilute hydrochloric acid should be given with each dose of the drug to children up to two years. The tablets should always be taken after meals with a large amount of water to avoid gastric disturbance and as the compound is not unpalatable to taste the tablets should be chewed before being swallowed so that the absorption may begin from the mouth. In the case of any gastric disturbance either the dose may be reduced or a small amount of dilute hydrochloric acid may be taken. Barring a sort of lassitude and dizziness during treatment the drug is found to be non-toxic under usual conditions. A serious nephritis is the only important contra-indication (*cf.* Anghelescu *et al.*, 1937).

In general the drug is well tolerated but the time of administration is important as the maximum therapeutic effect is not seen until after 48 hours (Long and Bliss, 1937*b*). This might be due to the fact, as recently pointed by Finklestone-Sayliss *et al.* (1937), that sulphonamide might have a much more efficient bactericidal action upon cultures that have passed through the logarithmic phase of growth than upon young cultures. It is less toxic than prontosil-red, so that it is possible to obtain a better protection by giving larger doses. But it must be pointed out that though sulphonamide is more useful, its toxicity and other by-effects are not at all negligible. Usually it is excreted entirely by the urinary tract within a short period (3 to 4 days); but in case there is any renal impairment, this excretion may be hindered causing further injury to the kidneys. In its clinical application certain toxic symptoms such as cyanosis owing to the formation of sulphæmoglobinæmia has been often observed (Discombe, 1937). For this reason it is often dangerous to prescribe the drug to Indian women as anæmia is present in a considerable percentage of them. Recently Archer and Discombe (1937) have thoroughly studied the cause of the formation of sulphæmoglobinæmia and have opined that free and unabsorbed sulphuretted hydrogen in the system, often formed therein by the action of bacteria on food residues, or as a result of administration of sulphur or sulphur-containing compounds, would promote the development of sulphæmoglobinæmia. This is further enhanced by the presence of substances which might act as a catalyst in the process of combination of hæmoglobin with sulphuretted hydrogen. For this, the prescription of magnesium or sodium sulphate to sulphonamide-treated patients should be avoided (Paton and Eaton, 1937). For its prevention 'the colon must be kept free from food residues by (*i*) cleansing it with enemata before treatment is started, if purges have previously been given; (*ii*) giving the patient a low residue diet, of adequate calorie value containing few eggs; and (*iii*) lastly giving large, regular doses of liquid paraffin'. Over and above the blood of the patients receiving the drug should be spectroscopically examined, as mere development of cyanosis does not necessarily indicate that it is due to the administration of the drug—this being often caused by other concomitant diseases, such as pneumonia. In the absence of sulphates, or any sulphur or sulphur-containing preparations like compound liquorifice powder, sulphur-containing diet, and even local dressings containing sulphur, large doses of sulphonamide may be well tolerated. But a high dose (12 to 24 gm. per diem) again may result in the

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formation of methæmoglobinæmia, when inhalation of oxygen would help in its disappearance within a day (Paton and Eaton, 1937). Another by-effect in the form of a characteristic febrile reaction causing the body temperature to rise was noticed by Hageman and Blake (1937). Acute hæmolytic anæmia (Kohn, 1937), toxic optic neuritis (Bucy, 1937) and different forms of dermatitis and dermal eruptions (Goodman and Levy, 1937) have often been reported but these do not produce any permanent injury and the symptoms are generally found to clear up on withdrawal of the drug.

The drug is an excellent prophylactic measure to minimize the risk of puerperal septicæmia and is of special value in abortion. It has been successfully used in the prevention of otitis media, arthritis and other infections which have been more fully discussed later on. In the treatment of all cases, however, the presence of hæmolytic streptococci must be verified by bacteriological examination. In a recent letter to the editor of the *Lancet*, Colebrook (1937) has rightly pointed out that 'it is hardly justifiable to use it as a prophylactic measure in quite normal childbirth. For deliveries involving "interference", *i.e.*, operative delivery, internal version, manual removal of placenta, etc., when the risk of sepsis is known to be greater in such cases, it must be essential to ascertain whether or no a hæmolytic streptococcus is present in the birth canal after labour, and, if it is not, to discontinue the drug as soon as possible. For this purpose a swab taken 6 to 12 hours after the expulsion of the placenta should be bacteriologically examined'. When a prophylactic measure in obstetrics is to be adopted it is essential to start it (dosage being one 0.5 gm. tablet 3 times daily) some hours before the probable time of delivery and repeat the dose at 6-hourly intervals for 3 or 4 days. If there be any complaint by the patient of lassitude and dizziness, the dosage should be reduced or the drug discontinued completely. Of course, if it be possible to protect patients in labour from infection with hæmolytic streptococci without any other toxic effect, it would be a marvellous advance in obstetrics.

Mode of action

But in spite of several investigations on various problems little work has yet been done on the way in which this important specific acts on hæmolytic streptococci. Unlike the chemotherapeutic studies with the protozoal infections, it is only the beginning of a similar study in bacterial diseases and it is just a year and a half ago that p-aminobenzene-sulphonamide has been found to be bactericidal against the hæmolytic streptococci *in vitro* and to a limited degree *in vivo*. In clinical experiments, of course, remarkable results have already been obtained. This discrepancy is being explained (Colebrook *et al.*, 1936) by the fact that the enhanced bactericidal action of the blood supplemented by that of the tissues of the whole animal. Long and Bliss (1937*a*) consider that stimulation of phagocytic activity of the polymorphonuclear leucocytes and of the monocytes of importance in the mechanism of action of the drug. On the other hand, examination of smears from the peritoneal exudate as well as the histological sections of the liver and spleen of mice after ingestion of the drug Mellon *et al.* (1937) obtained no evidence of phagocytosis. Recently, Finklestone-Sayliss *et al.* (1937) has again observed that the drug stimulates phagocytic activity of the reticulo-endothelial system and also the production of leucocytes by the bone marrow. Another characteristic of the compound is that it possesses a specific action *in vivo* even in cases when it has no such action *in vitro* (Kenny *et al.*, 1937). The streptococcal infection in mice had previously been prevented by infiltration of the inoculated area by acridine antiseptics, such as acriflavine and proflavine. The action of these drugs is directly bactericidal and purely local, whereas the action of sulphonamide is quite a different one and is obtained by introducing it *via* the alimentary tract, or by an injection remote from the site of infection. This has undoubtedly led to considerable interest in the chemotherapy of bacterial infection and we are now at the beginning of our knowledge about a class of drugs which might combat bacterial diseases as effectively as those which are specifics in protozoal infections.

Clinical reports

Although the drugs in this series have just been discovered, the literature on the treatment of diseases is already an extensive one. The may be roughly divided under the following heads :—

(*i*) *Puerperal sepsis :* Working with prontosil-red, Anselm (1935) obtained good results in the year 1935 in 13 cases of puerperal fever and also in septicæmia following abortion. Fuge (1935) treated 120 patients suffering from puerperal fever with large doses of prontosil-red and only three died. Ley (1936) reports good results in a number of cases and regards this treatment as superior to other medicaments. Recently, Foulis and Barr (1937) have treated 22 cases of puerperal septicæmia with prontosil album (sulphonamide) with successful result and the drug was tolerated even in large doses. In their study with several cases Colebrook and Kenny (1936) observed the development of sulphæmoglobinæmia in 7 out of 38 patients. A peculiar case of chronic wound infection due to hæmolytic streptococci following puerperal sepsis due to the same organism three years previously is described by Purdie and Fry (1937). The treatment was made with sulphonamide and the patient received for 19 days 1 gm. of the drug 3 times

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daily. For one week the wounds were irrigated daily with 1 per cent solution of the drug and after irrigation dusted with the drug in powder form. After discharge further 38 gm. were taken. Thus, a total administration of sulphonamide 95 gm. in all with local treatment with the same drug was followed by sterilization of wounds within three weeks and complete healing in six weeks. It is further reported that other procedures and actinotherapy had failed to give any relief in this particular case.

(*ii*) *Erysipelas :* Gmelin (1935) treated 10 children with erysipelas and observed rapid improvement. In a comparative study Kramer (1936) noted that injection of 20 c.cm. soluble prontosil reduced the febrile period in 23 cases of erysipelas to 4 days whereas in alternative treatment eleven days were required. Hartl (1936) reports successful treatment of 25 cases of erysipelas in adults. Excellent results in the treatment of this disease, scarlet fever, tonsillitis, impetigo and otitis media are also being reported by Long and Bliss (1937*a*).

(*iii*) *Streptococcal and meningococcal meningitis :* Experimenting with rabbits Proom and Buttle (1937) as well as Marshall *et al.* (1937) noticed that sulphonamide on oral administration is present even after 4 hours in the cerebrospinal fluid (0.2 mg. per c.cm.) in somewhat lower concentration than in the blood (0.3 mg. per c.cm.). This concentration (1:5,000) of the drug in the spinal fluid exerts a strong bactericidal effect on the streptococcus in *in vitro* experiments with human blood, and on the meningococcus in culture media. These observations and its comparatively higher solubility in organismal fat (Finklestone-Sayliss *et al.*, 1937) justify its administration in streptococcal and meningococcal meningitis.

Caussé *et al.* (1936) first reported a case of meningitis successfully treated with prontosil. The patient was a man of 46 attacked with hæmolytic streptococcal meningitis of otitic origin. The patient's spinal fluid was sterile in 48 hours. Ten patients with meningococcic meningitis were successfully treated with sulphonamide (Schwentker *et al.*, 1937). Similarly Anderson (1937) in one case and Weinberg *et al.* (1937) in two cases obtained good results by the prompt use of sulphonamide in streptococcic meningitis. Branham and Rosenthal (1937), however, advocate a combined treatment with the drug and serum rather than with either alone.

(*iv*) *Gonorrhœa :* A close biological relationship between the meningococcus and the gonococcus naturally suggests that the drug might be successfully used against the latter infection. Of course, its use in such cases is still in the experimental stage and the specificity has often been questioned (Anwyl-Davies, 1937). However, certain cases have been successfully treated with this new drug. Dees and Colston (1937) have found that in the majority of cases the urethral discharge and symptoms of burning and frequency promptly disappear. Similarly, Klose (1936) and Herrold (1937) reported better results with the amide in gonorrhœa. According to Erskine *et al.* (1937) the treatment with the drug along with daily urethral irrigation with potassium permanganate is found to be more promising.

(*v*) Bacillus coli *infection :* The introduction of this drug is a marked advancement in the treatment of urinary infections. Imhäuser (1935) was the first to note the results of administration of sulphonamide in *B. coli* infections of the urinary system. A number of cases of *B. coli* pyelitis in children was cured by Huber (1936). Kenny *et al.* (1937) have also reported that small oral doses (0.5 gm. tablets 3 times a day for 5 to 7 days) of p-aminobenzene-sulphonamide effect the rapid disappearance of *B. coli* and pus cells from the urine and remission of symptoms in 46 women with urinary tract infections. Helmholtz (1937*b*), who previously (1937*a*) reported striking results with this drug in treating infections with *B. coli*, opines that sulphonamide is even better than the other urinary disinfectant, mandelic acid, especially in infections with *B. proteus* and *Aerobacter aerogenes*.

(*vi*) *Streptococcal septicæmia and other infections :* Robinson (1937) treated a case of streptococcal septicæmia with prontosil. Roth (1935) reported good results in rheumatic endocarditis and Recknagel (1935) in tonsillitis, pneumonia and rheumatoid arthritis. prontosil-red was also successfully used in 3 cases of typhus (Schmidt, 1936). In affections of the skin and mucous membrane, Jaeger (1936) advocates its local application. He also used it locally in a solution or as dressing in wounds, boils, carbuncles, eczema and various fungus infections of the skin. In cases of Ludwig's angina and cellulitis of the legs with septicæmia death has, however, been recorded (Long and Bliss, 1937*a*). Quite recently (Van der Wielen, 1937), prontosil has been used in a case of quartan malaria with apparent success.

Conclusion

Previous to the discovery of this drug puerperal fever and other streptococcal diseases were generally treated with biological products which are usually inconvenient and have other drawbacks. It is now evident that the sulphonamide for its rapidity of action and simplicity of administration is being found to be specially valuable in various streptococcal and other bacterial infections. Its cheapness in comparison with other medicaments is also an additional advantage. Of course, as already pointed out, the consequences of its use are increasing in complexity. Moreover, it has been recently shown (Bliss and Long, 1937) that the compound has no bacteriostatic action against organisms of group D (Lancefield) *beta*-hæmolytic streptococci and the minute members of group G *beta*-hæmolytic streptococci. This

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probably means that a more scientific classification of the infecting streptococcus before administration of the drug would probably ensure better clinical results. It is, however, beyond dispute that if after proper bacteriological examination the correct dosage and method of administration be followed, the drug would be found to be specific in certain bacterial infections. Lastly, it must be remembered that though the drug holds out promise of great usefulness, caution should be observed with its treatment and, even if no serious toxic effect be noticed, it is advisable that the patient should be kept under close careful medical observation.

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THE PHYSIOLOGY OF THE INDIVIDUAL IN THE TROPICS*

Part I

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THOUGH physiology in its widest sense signifies the study of the phenomena presented by all living organisms, its chief interest is centred round the body of man. It should therefore be the objective of human physiology to study the so-called 'normal' human individual since it provides an essential base line for the study of disease. Unfortunately, however, in this particular branch 'physiology' in spite of all its developments has made but little progress in recent years. The definition of 'normal' and the criteria of what constitutes the normal are still an open question. There has been a tendency among physiologists to lay stress on individual organs and tissues—'on single bricks' composing the edifice—and not on the individual as a whole. As the human individual cannot exist uninfluenced by his external environment and as the environment is

*Abridged from the Presidential Address of the section of Physiology, 25th Indian Science Congress, Calcutta, 1938.

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variable the question of normality of the individual becomes relative, and has to be studied under the varying conditions of the altered and continually altering environments to which the individual must necessarily be subjected in different parts of the globe. In choosing the subject of '*The physiology of the individual in the tropics*', I had two objects in view. In the first place, I was anxious to select a subject which would be of interest to physiologists as well as to the medical profession in India; in the second place, I choose it as a subject which is of fundamental importance, but which has suffered from comparative neglect in modern medical thought.

The individual and his environment

Historical.—The study of the individual in relation to his environment has recently engaged the attention of many a physiologist and clinician though the problem is by no means a new one. In the earliest days of medicine in India centuries before the Christian era, the Hindu physician *Charaka* drew attention to the effects of different 'airs' and places on mankind. He prescribed special diet for particular seasons of the year, recommending one type of food for the summer and another for the winter. In the early dawn of Greek medicine Hippocrates recognized not only the significance of a 'change of winds' but also its physiological implications. After considering the effects on the embryo and the adult, he concluded that the races of mankind and types of animals were altered, as a result of the environment—and in this the 'airs, waters, and places' played a part. The Hippocratic recognition of the association between meteorological conditions (airs) and disease came down through the Middle Ages and practically every writer on medicine and physiology from the 17th to the 19th century stressed in different ways the 'Integration of the macrocosmos (environment) with the microcosmos' (the human organism). The interest in this subject waned in the last quarter of the 19th century when the science of bacteriology made its beginning through the pioneer researches of Pasteur, Lister and others.

In the study of diseases, emphasis was laid more on the invading parasite than on the invaded individual. With the advent of the science of immunology, serotherapy and chemotherapy, the importance of environmental influence receded more and more into the background. Whilst the physiologists studied the changes produced in the system by alteration in temperature, bacteriologists tended in their first enthusiasm to disregard the physiological fluctuations and attempted to attribute every disease process to specific parasites.

The reaction to environment.—Though the interest of medicine at present is chiefly centred, and perhaps rightly, on infectious diseases, the study of environmental conditions is none the less important. Let us consider how the individual reacts to his surroundings. Two methods have been devised by the organism to meet the forces of the environment. It seeks to lessen the impact and to meet the shock by increasing the resistance, in an endeavour to prevent disturbances of its equilibrium. This is usually effected by diminishing the consumption of energy or, in other words, the organism becomes *less reactive*. This phenomenon of attempting to shield itself against invasion is exemplified in spore formation and in the various forms of encystment of lower organisms. In the higher organisms, the same reaction finds expression in the mechanism of hibernation, in the deposition of subcutaneous fat and in the development of the epidermis. The other alternative is that the organism becomes more *reactive* and, instead of resisting any force disturbing its equilibrium, seeks to attune its mechanisms of equilibration to such a degree that they swing in a rhythm with the environmental force. This is seen in the development of special mechanisms for the rapid mobilization of reserves, in the unusual acuity of receptors and not infrequently in the formation of special sense organs. Man, after all, is a living organism existing in his own particular environment and, being endowed like all living beings with powers of adaptation, he reacts to it in such ways as to produce, if possible within himself, ideal conditions for living under varying environments. This adjustment must necessarily involve fundamental physiological changes in the organism, and probably also in its powers of resistance to disease. The history of man is not inaptly described as 'an endeavour first to adjust himself to his environment and later to control that environment itself'.

The mechanisms designed to meet the environmental demands and the selection by the organism of different methods for adaptation are manifold. We will consider them in more detail later. It is important to emphasize here that it is not enough to understand any one reaction to a single well-defined change in environment; the repercussions on other reactions must also be determined and the degree to which they affect the capacity of the individual to react to further environmental changes of a different type. Such knowledge is essential if the organism is to be understood as a unit. The problem is naturally complicated and raises many interesting enquiries.

The individual and his physiological equilibrium

The external environment with the effects of which we are concerned is not in reality the one in which the body cells live. As is well known, though the external environment varies greatly, the internal one remains remarkably constant and this is achieved, firstly, by certain physical and chemical factors inherent in the saline fluids which constitute the internal environment—the '*milieu interne*' of Claude Bernard, and secondly, by certain bodily reactions designed to prevent abnormality. An outstanding example is the constant neutrality of the fluids which bathe the body cells where even a slight increase in the hydrogen-ion-concentration from 0.000,000,05 ($10^{-7} \times 5N$) to 0.000,000, 1N (10^{-6} N) might produce a serious dislocation of the vital processes. To counteract any such disturbances, there is always an effort on the part of the organism to oppose any tendency to change. This is best seen in the rapid breathing associated with all forms of muscular exercise. A contracting muscle needs proportionately more oxygen than a quiescent one; this increased oxygen usage implies an increased blood supply which again involves an augmented blood flow through the lungs and consequent increased ventilation. Similarly, the response to a rise of body temperature sets in motion simultaneously a number of complex reactions which tend to oppose any threatened alteration.

The apparent physiological stability of a living being which is suggested by the constancy of such characteristics as heart rate at rest, body temperature, blood sugar level, reaction of the blood, blood volume, blood pressure and composition of alveolar air, is not due to a static condition, but is only made possible by the lability and close correlation of dynamic forces which are constantly being adjusted in response to nervous, chemical or physical stimuli arising within or at the surfaces of the body. The equilibrium thus attained is therefore of an oscillatory type and is the resultant of the interplay of unstable and variable functional activities which are constantly operating in the body. Thus, the carbon dioxide content of alveolar air is remarkably constant in any individual and is controlled by the depth of respiration, which in turn is regulated by the carbon dioxide content of arterial blood; the respiratory centre is so sensitive that it will respond to changes which cannot be easily measured by chemical or physical methods. The high degree of sensitivity maintains the equilibrium without demonstrable oscillation but the oscillatory nature of the equilibrium may be unmasked and become recognizable in certain diseases as Cheyne-Stokes or other types of periodic breathing.

The temperature of the body is maintained fairly constant in health, despite variations in external temperature and activity, but during illness or during recovery from illness there may be a lack of sensitivity or some degree of failure of the regulating mechanism and the least exertion may cause an abnormal rise of temperature producing profuse sweating with a temporary fall of temperature below normal. Similar examples showing the oscillatory nature of physiological equilibrium might be taken from circulatory

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adjustments, muscular co-ordination or from the regulation of blood-sugar level.

The range of reactivity and the limits of adaptability.—Interference with or destruction of these compensatory mechanisms will reduce the chance of recovery from accidents or diseases in which their activities are required to counteract the disturbance. A given compensatory mechanism may be adequate to maintain, under resting conditions, a physiological equilibrium within normal limits, so that the effect is not recognized until the mechanism is subjected to some stress. Thus, two individuals may have the same heart rate under the same resting conditions, but if the vagal impulses in both are eliminated by the injection of atropine, it may be found that the heart rate of one considerably exceeds that of the other. The heart rate is controlled by two opposing forces, one from the vagus and the other from the sympathetic, and although the net result of these may be the same in both before the injection of atropine, yet in the one a greater amount of nervous stimulation takes place than in the other. Again the fasting blood sugar level in two individuals may be identical and yet the injection of the same amount of adrenalin into each may cause in the one a much greater rise in blood sugar than in the other. Insulin will be less effective in the former than in the latter, suggesting that the self-adjusting mechanism in the one case is 'set' at a different level from that in the other, although the controlling factors in each case are so balanced that the equilibrium points are the same. Neither heart-rate nor blood sugar level *per se* therefore gives any clue to the reserve powers of the complex systems which control these physiological characteristics. Hence the test of physiological normality is relative and is not solely or even mainly the equilibrium point of the various compensatory systems. In fact, the extent to which these systems will respond, when brought into play by adverse changes in the environment of the individual, and the degree of their response are measures of the organism's reserve capacity or power of adaptation. On this reserve power depends the success of the individual in his adaptation or acclimatization to changed surroundings and environments.

Environment and the Mechanism of Adaptation

Physiological factors in adaptation.—Adaptation has been aptly defined as the continuous adjustment of internal relations to external relations. The ability to respond actively to changes in environment is an essential characteristic of any organism. The range of environmental adaptation of even the most primitive cell is relatively wide, although the mechanism of response may be simple; but as we advance in the scale of animal life, the range of adaptation becomes even greater as the mechanism and the means of adjustment become more complex. Thus the single-cell organism existing in a relatively stable fluid environment needs only direct adjustment to the environment and this adjustment must of necessity be a *'chemical'* one. This is exemplified in the behaviour of the protoplasm of the *myxomycetes* which, when placed on a piece of blotting paper, will crawl towards an infusion of dead leaves or away from a solution of quinine. The amœba again can respond only to changes in the composition of the fluid in its immediate vicinity. When multicellular organisms begin to specialize, this comparatively simple chemical adjustment is not found adequate and special methods have to be elaborated, by which a 'colony' type of life can be perpetuated. Individual cells of multicellular organisms begin to manufacture substances through which the different members of a cellular unit can be influenced. These substances or 'hormones' circulate in the fluids of the body, and play an extensive rôle in *hormonic* adjustment to environment. Their primary purpose is to initiate automatic reactions and to sensitize the tissues to react either more rapidly or more slowly. The higher we ascend in the animal scale, the means by which the organism responds to environmental changes become more varied and complex, and an additional mechanism of adjustment other than chemical and hormonic is called for. For this purpose, the anatomically-defined autonomic *nervous* system, both sympathetic and parasympathetic, has been developed. Finally, when the highest level is reached at which reason is developed, not only are accomplished changes appreciated but the possibility of alteration, made or threatened, can be recognized and guarded against; in other words, the adaptive reactions become conscious and adjustments to meet them 'volitional'. Thus, among higher animals the distance receptors (eye, ear, nose) give warning of approaching danger, while in man complex mental processes allow the possibility of altered environment to be inferred, although the actual change may not be imminent. All the reactions of a biologic mechanism to environment may therefore be said to be mediated through three distinct but mutually-related and integrated processes—chemical, endocrinal and nervous. The three components are functionally inseparable, so no one component can be disturbed without disturbing the others.

Reserve forces of the organism.—A living organism, whether a single cell or an integrated cell mass (the individual), may therefore be regarded as a highly unstable system, which tends to reproduce itself continuously under the average of conditions to which it is subject, but undergoes disintegration as a result of any variation from this average. The ability to maintain an equilibrium without the breakdown of the adaptive mechanism under adverse conditions determines the development of the individual and ultimately of the species. The greater the possibility of protective reaction the greater are the chances of survival. It seems important therefore to stress the fact that the animal body, although often compared with a man-made engine, differs fundamentally from the latter in that it has latent reserve forces capable of adjusting the animal to a new environment, in other words it possesses powers of adaptability. These forces call forth hypertrophy of glands and tissues in response to appropriate stimuli and even carry out repair of damaged parts. Sensibility or facility of response can be improved by frequent usage or 'training', as in the case of muscular exercise. The athlete can undertake a given amount of exercise with less disturbance of respiration and circulation than can the untrained person and his return to the resting normal condition is also quicker. Unlike a test tube, in which chemical reactions are definitely limited, the efficiency of practically all the compensatory systems of the body can be increased by judicious use if the stimulus producing the reaction is adequate in each case.

The Individual and his Atmospheric Environment

The most important environmental factor is the atmosphere in which we live. Hippocrates, who may be called the father of the modern science of climatology, recognized the importance of 'airs' over 'waters' and 'places' and also appreciated the different qualities of the cold and the tropical atmospheres and other cosmic influences. As the atmospheric environment is so familiar, we fail to recognize the importance of the part it plays in moulding the physiology and sometimes the pathology of 'air-living' animals. We are likely to forget that we take in as much air by weight per day as we do of food.

The atmosphere or the air-mass surrounding the earth is not stable but fluctuates from place to place and from time to time, particularly with the 'cyclonic' waves. These fluctuations and atmospheric disturbances are normal and necessary sequences to temperature differences on the earth's surface. It is not my purpose here to examine these meteorological disturbances in detail; I only wish to draw attention to the influences which such an unstable and ever-changing aerial environment exerts on different phases of human activity—physical, mental, social, economic—and even racial development and retrogression.

Climate and climatic factors.—The term 'climate' has been defined as the combined effects of the sun, the atmosphere and the earth upon living objects at any one place on the earth's surface. Climate primarily results from the effects on the earth's surface of the incident solar energy and its unequal distribution,

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descriptive purposes it is usually stated in terms which have reference to the so-called *climatic elements*—namely the temperature of the air, its humidity, also the amount of precipitation of rain, snow, frost, its motion, density, transparency and electrification. The climatic elements are dependent on physiographic factors, such as distribution of land and water, mountain ranges, nature of soil, distance from the equator and height above the sea level. The latitude and the altitude are, however, the most important and deserve special attention.

The words 'climate' and 'weather' are often used synonymously in common parlance but 'weather' means those atmospheric elements we see, feel or observe at a particular time or specified period, while climate means the aggregate of weather conditions. In cold and temperate latitudes, the weather becomes a more outstanding feature than the climate itself. In the tropics, for the greater part of the year, the climate becomes a succession of equal combinations of meteorological elements, the annual range of which seldom exceeds the diurnal range. The 'weather' in the tropics therefore is practically the same as the 'climate'. The monotomy of the tropical climate is a characteristic not seen in the temperate or cold regions of the globe.

Climate in the tropics.—It is generally assumed that the climates of the whole of the tropical zone are in all respects alike and therefore the term 'tropical climate' is often used, though incorrectly. Climatologists have divided the tropical belt into several subdivisions according to the situation of the land in relation to the equator, the vicinity of water, the growth of vegetation, the presence of mountains or hills,, the proximity of land to oceanic currents and trade winds, and its height above the sea level. All these factors will naturally influence the 'climatic type' of a locality. Thus the tropical zone includes deserts, damp forests, jungles, swamp lands and fertile islands refreshed by cool steady winds from the ocean, low-lying plains and valleys under the influence of the periodic monsoons, and mountains several thousand feet above sea level. All these regions are not equally disagreeable for the residents. The deserts, for example, are free from many tropical diseases, for their parched soil and dry, sterile air are unfavourable to the development and distribution of most micro-organisms and disease-bearing insects. On the other hand, the dust, heat and brilliant sunshine are very trying, and the paucity of water is obviously a serious limitation. Again, wherever mountains and plateaux occur in the tropics, the climatic conditions are distinctly different from that in the plains and may be actually mild and agreeable. It will therefore be seen that, within the tropical zone, there may be areas with peculiar climatic types with their special advantages and disadvantages. In dealing with climate in the tropics, I shall confine myself to the consideration of its effects in tropical plains in the latitudes near the equator.

The climate in these regions varies but little and the temperature ranges between 75°F. (25°C.) to about 115°F. (46°C.). There are no seasons in the tropical zone and monthly and diurnal variations of temperature are slight. These areas are often subject to the influence of monsoon with their alternate dry and wet spells. They are usually very fertile and support a variety of luxuriant vegetation. The study of the climates prevailing in this zone has attracted most attention because these areas have been frequently colonized by the white race. A large portion of the plains of India has a climate of this type and therefore it is of very great interest to us to know the physiological adjustments required of human beings in such a climate.

Climate and the individual

The influence of climate on man is so well recognized that it is often the main topic of daily conversation. One often hears of a 'bracing' climate or a 'relaxing' climate, and the beneficial effect of climate variation finds its expression in our desire for a 'change of air'. Though we do not know whether and to what extent actual temperature, or humidity or wind affects human beings, there appears to be a direct relationship between the physical and mental vitality and the variability of climates. Huntington in his fascinating book on 'Civilization and Climate' puts forward the theory that all the world's great civilizations are now in regions experiencing often unexpected changes of weather and that the superiority of races inhabiting temperate regions of the globe is largely the result of climatic influences. Man is considered a mere creature of his meteorological environment and climate is said to rule the destinies of nations. Mills (1934 to 1936) has corroborated some of Huntington's conclusions. According to him, there are energy differences between the races living in warm climates and those in temperate climes which cannot be accounted for on the basis of diet and mode of living alone. The tropical person has a lower oxygen consumption, a lower blood pressure and a lower capacity to meet emergencies than the resident of temperate zones. Some psychologists maintain that each climate tends to develop its own characteristic mentality. In other words, climate not only modifies the physical features but also the nervous system of the individual. These and other similar questions raise interesting issues which are not easily answered. Because of the difficulty involved in the study of the direct effects of climate on the individual, the data recorded in the literature are very discordant. There is a school of thought which maintains that too much stress is laid on climatic factors by Huntington and Mills and that many of their generalizations probably are not based on a rigidly scientific and critical evaluation of the facts. While it is not possible in the present state of our knowledge to give any definite opinion, there appears to be little doubt that climate plays an important rôle, though often an indirect and subtle one, in the production of many physiological changes in the organism and as a predisposing cause or an accessory cause in many disease processes. I propose to examine some of these changes in the subsequent sections. It will suffice here to indicate that though man can live in any region where food and water can be obtained, he can best develop his physical and mental capabilities under the most favourable environmental conditions. There seems but little doubt that there is also a distinct optimum condition for man, just as for plants and animals, and any departure from it adversely affects the organism.

Effects of heat and sunlight in the tropics

In considering the effects of residence in tropical climates, attention is at once directed to three major environmental factors, *viz, temperature, humidity* and *sunlight*. There are a number of other climatic and environmental factors, such as wind movement, atmospheric electricity, ionization, etc., which also affect the human organism, though the responses elicited do not leave lasting impressions on the individual. In nature, all these climatic factors operate simultaneously and the reactionary changes observed at any one time are in most cases a summation effect, one factor being superimposed on the other. Thus while the acute effects of encountering very high temperatures as of a heat wave in a desert region may be tolerated without harm, the organism may show signs of intolerance or breakdown when excessive humidity is superimposed on such a high environmental temperature. This interdependence of several climatic factors makes the analysis of the effects on the individual of the different components which constitute the 'climatic drive' a difficult matter and is mainly responsible for many of the conflicting views which have been expressed. Let us consider each of these factors separately and see to what extent each component contributes to produce the resultant total effects.

Sunlight.—The biological effect of sunlight has received perhaps more attention than any other factor in this group. A careful perusal of the literature has convinced me that the knowledge gained in this branch is indefinite and unsatisfactory. The beneficial results obtained by heliotherapy in tuberculosis and the effects of ultra-violet light in the treatment of rickets created the impression that the ultra-violet portion of the spectrum was the important factor responsible for the biological

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effects produced. Several investigators in the tropical belts of Australia, the Philippines and the Netherlands East Indies have adduced experimental evidence indicating that the ultra-violet light, being non-absorbable by the skin, is probably much less important than the infra-red and the visible-red end of the spectrum, which penetrates the superficial layers of the skin and is perceived by the organism as heat energy. Whatever direct effects tropical sunlight may have have therefore been attributed to its thermal action. Petersen (1936) has, however, shown that ultra-violet rays may produce physiological effects by first sensitizing the skin and then inducing a reflex stimulation of the thyroid and other glands of internal secretion. It is difficult in the present state of knowledge to evaluate the evidence with regard to the part played by the different components of the spectrum in producing physiological reactions in the individual.

Humidity.—The effect of humidity on the human organism has recently engaged the attention of public health authorities and sanitary engineers interested in environmental control through air-conditioning methods. That humidity modifies, to a great extent, the effects of heat is generally recognized. A moist humid atmosphere is associated with depression and discomfort, and, conversely, dry air, irrespective of its temperature, induces a feeling of comfort and well-being. The water content of the atmosphere must affect the water content of the body. In the regions of high environmental temperature, such as are met with in the plains of India for example, greater humidity will prevent proper evaporation and heat loss with resulting disturbance in the respiratory exchange, in the carbon dioxide content of the blood, and consequently in the water and ion balance. It may therefore be stated that high humidity, by diminishing evaporation of sweat, merely aids in increasing the effects of heat, but as a direct factor it does not appear to possess any great specific importance.

Temperature.—Studies on the changes produced in the body of man as a result of exposure to high environmental temperature have been numerous, but, like most aspects of tropical physiology, the data are conflicting. It has been reported that a change in the environmental temperature produces a change in the *body temperature* of the individual and that in the tropics body temperature may be permanently above the average in the temperate zones. Though a large amount of work done both in man and in experimental animals has since been published, the position is still undecided. While it is true that a change in the body temperature of an individual may be easily effected for brief periods by exposure to high external temperatures, it is doubtful if, in view of the sensitive heat-regulating mechanism in man, a permanent change can be brought about by prolonged exposure such as residence in the tropics. The same argument may be adduced against the contention of some workers that the *skin temperature* is raised in tropical zones. From physiological considerations, it is logical to assume that the flushing of the skin, as a result of exposure to a hot environment, raises the skin temperature, but the temperature soon drops when perspiration breaks out. It has also been suggested that darker coloured individuals in the tropics possess a higher skin temperature than the light coloured ones. The statement also has not been confirmed.

Regulation of body temperature.—The chief climatic factor affecting the individual in the tropics being the high environmental temperature, the adaptation that he is called upon to make is naturally one of heat regulation. This is accomplished by a fine balance between *heat production* and *heat dissipation*. Heat is always produced in the body by the metabolic activities of the protoplasm and, if life and the power of work of the individual are to be maintained, this heat production cannot be reduced below a certain minimum. Hence, heat regulation of the individual is more often effected through modifications of the various mechanisms available for heat loss, than through changes in heat production.

Heat loss and rôle of pigment.—It was generally recognized that tropical races are at an advantage over the European settlers in the matter of heat dissipation. The possibility suggested itself that acclimatization for generations in a climate where the mechanism of heat loss had to operate under excessive strain might have endowed the skin of the tropical races with an additional power and facility in getting rid of excess heat by the processes of physical heat regulation—conduction, convection, radiation and evaporation—at a more rapid rate than individuals from cooler zones. It has been claimed that the skin of tropical races loses heat by convection more rapidly than the skin of white races, but these conclusions have not been universally accepted. The suggestion next put forward was that the dark skin radiated heat more quickly than the white skin, but satisfactory evidence has not been obtained in favour of this contention. It is therefore difficult to state with any degree of certainty whether the presence of pigment in the skin confers any real advantage so far as heat loss by *radiation* is concerned. There is however little doubt that pigment plays an important part in heat regulation in other ways. Owing to the high absorption coefficient of melanin, heat is rapidly produced in the skin, this stimulates the local heat receptors with consequent reflex sweating. Moreover, pigmentation of the skin is necessary to protect the deeper structures from the injurious effect of sunlight and to protect the sensitive cutaneous nerve endings from irritation. The brown-skinned races in the tropics by virtue of the pigment, have apparently developed a more sensitive cutaneous heat-regulating mechanism and they can cool off more rapidly by reason of the early formation of a fine layer of sweat drops. It is generally admitted that Europeans who tend to take on pigmentation are on the whole better acclimatized to the tropics than those who do not darken. The studies of Acton in the School of Tropical Medicine on the pigments of the normal skin of Europeans and Indians are of interest in this connection. He found that the pigments present in the basal cell layer of the epidermis of the two groups did not differ in the actual amount (quantity) but in their chemical composition (quality). The pigment present in the Indian skin was deeper brown in colour and showed a distinct tendency to increased chemical reaction with 'dopa-oxydase'. The significance of this is not yet clear. The precursor of melanin is dioxyphenylamine which is again a breakdown product of the amino-acid tyrosin. It is possible that the differences in the diet and metabolic rates in the natural tropical inhabitants might be ultimately associated with the production of a chemically-distinct type of pigment in the skin. The distribution of pigment may also play a part in bringing about the adaptation which the tropical inhabitants are supposed to possess. Thus, in negroes, histological evidence shows that pigmentation is deeper and more diffusely spread than in the white races where the pigment is contained chiefly in the Malpigian layer and in the superficial layers of the corium.

Sweat secretion.—For physical heat regulation, however, the activity of the sweat glands is of outstanding importance. Their efficiency depends on several factors: (1) humidity of the environmental air, (2) concentration of sweat glands per unit area, and (3) the degree of activity of these glands. Humidity, though it is important, because on it depends the evaporation of water from the skin, does not in actual practice exert a great influence, because apparently high degrees of humidity, provided they fall short of absolute saturation, can be borne by the system with impunity. The concentration of sweat glands in the skin may regulate the amount of perspiration, and it was believed by many early workers that the better heat-tolerance of the dark-skinned races was probably due to this factor. Though some investigators have reported a greater concentration of sweat glands per unit area of skin surface among them, these findings have not been corroborated. From the point of view of heat loss, increased concentration of sweat glands cannot be considered specially significant as the quantitative outpouring of sweat is less important than its distribution on the skin to form an even film which leads to rapid evaporation.

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Composition of sweat.—A study of the composition of sweat produced in extreme dry heat shows that there is an adaptive response on the part of the organism and that the concentration of salt in sweat decreases after the first few days in the hot environment. To cite a concrete example, the amount of sweat produced with ordinary type of work in a climate such as that of Calcutta (95° to 105°F. or 35° to 41°C.) may be as much as 7 litres during the day. Assuming a sodium chloride concentration of 0.3 per cent, this means a loss of 22.5 gm. of salt. Man's daily intake of sodium chloride is 10 to 15 gm. and since the average normal excretion of salt in the urine is in the neighbourhood of 12 gm. in 24 hours, the degree to which muscular work in such a climate may deplete body chlorides is remarkable. If this depletion is not compensated, the normal acid-base equilibrium of the body fluids is apt to be seriously disturbed and heat cramps from loss of salt may supervene. It seems clear that some sort of adaptation takes place in normal healthy individuals. Little is known, however, of the nature of this adaptation, though it has been noted that all men sweat more readily as they get accustomed to exposure to heat. This increased 'ability to perspire' is known to be one of the few definite adaptations to high temperature and it is interesting to note that it is a case of 'controlled' rather than profuse wasteful sweating. The sweat secreted is said to contain an unusually low concentration of sodium chloride and this would appear to be an attempt at conservation of chlorides, as even on a high chloride intake their concentration remains low.

(*To be concluded in the next issue*)

Medical News

FIFTEENTH ALL-INDIA MEDICAL RESEARCH WORKERS' CONFERENCE

The Viceroy's address

THIS conference of research workers has been held each year during the last fifteen years. On each of the previous occasions it has been held at the Calcutta School of Tropical Medicine. As His Excellency the Viceroy had kindly promised to open the conference, and for other reasons, this year it was decided to hold it at the Imperial capital. There were over a hundred delegates at the conference; each Indian province was represented, usually by more than one delegate; delegates were also sent by Burma, the railway department, and the defence department; and there were a number of visitors including representatives of the Rockefeller Foundation and the London School of Tropical Medicine.

His Excellency the Viceroy opened the conference on Monday, 29th November. He said:—

'Medical research is a matter in which I have always taken the keenest personal interest and I had, for some time up to the date of my assumption of office as Viceroy, the honour of presiding as chairman over the Medical Research Council of the Privy Council.

'It is, in these circumstances, a source of peculiar pleasure to me to see you here to-day and to be able to pay a tribute, in person, to the invaluable work which has been done, over so long a period, by the Indian Research Fund Association and the bodies connected with it and by the research workers whom you, ladies and gentlemen, represent to-day.

'The advance in the organization and development of medical research in India has been particularly marked in the last 25 years. In 1911 the Indian Research Fund Association was established, and although the years of war, which followed, interrupted the work which it was designed to further, the foundations had been laid and, on the conclusion of the war, the opportunity was taken for development in many important directions.

'In 1920 the School of Tropical Medicine at Calcutta, the necessity of which had so long been realized, was established largely through the efforts and enthusiasm of Sir Leonard Rogers.

Health research

'In 1932 the munificence of the Rockefeller Foundation made it possible to establish the All-India Institute of Hygiene and Public Health, a centre at which provision has been made for research, which has been actively pursued on the subjects of nutrition, and malaria and cholera, since 1921.

'The research workers have annually met in conference, a conference attended not only by senior officers of the medical and public health departments of the Central and Provincial Governments, but by other research workers from all parts of India. I cannot overestimate the importance which, in my judgment, attaches to an occasion such as this for the interchange of views and the free discussion of questions of fundamental importance by experts of recognized eminence and distinction in their respective fields.

'It will not be possible for me to-day in the brief time at my disposal to do more than touch on two or three aspects of the work of medical research at the present time.

Help from the public

'Before I proceed to mention certain individual items in which I take a particularly close interest, I would like of say briefly how great is the importance from the point of view of India that attaches to the close and earnest pursuit of the solution of the many problems which still lie before us in the field of medical research, and how strong is the case for the generous support of philanthropists in this country in providing financial assistance for activities, the outcome of which is of such great significance to the whole of this subcontinent.

Tropical research

'The School of Tropical Medicine at Calcutta, the work of which has been so invaluable, is fortunate in having a large endowment fund, which was raised from donations from commercial associations and firms principally in Bengal and Assam, such as the Indian Tea Association and the Indian Jute Association. No one, who is aware of the invaluable results which have emerged from the work and the researches of the School of Tropical Medicine and its officers, can for a moment hesitate as to the value which has been obtained for the money which the bodies in question with such public spirit provided in aid of research.

'The All-India Institute of Hygiene and Public Health, the work of which again is so material to the maintenance of health and the reduction of the incidence of mortality in India, is the result of a private munificence, but of private munificence from a source outside this country. The appeal I would make is to those private individuals who have the welfare and the improvement of standards of health in this country at heart to bear in mind the strong claims of medical research in its various forms to their munificence. There is no way, I am sure, in which a more real and valuable contribution can be made to progress in India and I can most warmly commend the claims of medical research to consideration in this connexion.

'There are one or two problems on which I would like to say a word to-day in regard to the work which has been performed by medical research in India on malaria, nutrition, cholera, the reduction of maternal and infantile mortality and the ever-growing and most important problem of tuberculosis.

'We are all of us familiar with the immense significance of the problem of malaria particularly in rural areas and we can, I think, contemplate with satisfaction the admirable work which has been done during the last few years by the Malaria Survey of India.

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'As some of you may know, when I assumed office I found that the threat of malaria to the health of Delhi, new and old, was rapidly developing into a serious menace and last year and this year the Malaria Survey has in the Delhi area undertaken detailed and extensive anti-malaria schemes. The actual work is carried out by the public works departments.

Delhi experiment

'The development of these schemes which I have inspected on various occasions has given me the opportunity of satisfying myself over a long period of months in Indian conditions as to the extent to which prophylactic measures can with profit and with the certainty of success be undertaken, and I am glad to say that the schemes, which have been initiated and which have been developed so successfully in and round Delhi, show now, more than a year after they had first been undertaken, results which entitle us to feel confident that the growing threat of malaria in this very important area will be brought under control if not altogether eliminated.

'What has been done in Delhi can be done elsewhere, and I would commend to malaria-stricken areas the work of the Malaria Survey and the example afforded by the success of the operations which have been undertaken in Delhi.

Cholera prevention

'Much remains to be done in connection with cholera research, a question which has always been considered of international importance and on which the Permanent Committee of the Office Internationale d'Hygiene Publique asked some years ago for the assistance of the Government of India. The assistance was, I need not say, readily accorded and I am glad to think that the Office Internationale has on several occasions expressed its warm appreciation of the admirable results which have been obtained by a number of different laboratories and workers in India under the co-ordinating superintendence of Colonel Taylor, the Director of the Central Research Institute at Kasauli.

'There is great hope that the investigations now proceeding will eventually solve many of the difficulties associated with the control and prevention of this disease.

Nutrition problem

'You are well aware of the interest I take in the matter of nutrition research and in this very important question India, thanks mainly to the work of Sir Robert McCarrison, can claim an eminent place. Nutrition and immunity, as an eminent authority has pointed out, constitute the two most powerful weapons in man's hand for his fight against disease. Adequate nutrition has a positive contribution to make to the health and the sense of well-being of the individual. The subject is, I am well aware, one of extreme complexity in this country, because the problem of nutrition is so closely associated with the economic condition of the people and because of the poverty which to the profound regret of all of us prevails in so many parts of India.

'Any attempts for the improvement of the position must, therefore, take note of the existing food resources of the country and must devise means for their augmentation.

Lack of knowledge

'A difficulty too, the importance of which will not be overlooked, is that in regard to a large section of the population a lack of knowledge as to the modern dietetic principles may frequently prevent them from utilizing even the available resources to the fullest possible extent.

'I fully realize that this is a problem which is fundamentally one for Provincial Governments and local authorities, but I am sure that those Governments and those local authorities can look with confidence to the Indian Research Fund Association to assist them by carrying out such research as may be essential for formulating administrative policy, and I would refer in particular in this connection to the invaluable work which has been performed by the Nutrition Research Laboratories of the Association at Coonoor.

'As you are aware, those laboratories have applied themselves for years past to nutrition research, to the study of the diets of the different communities in India and to deal with specific nutritional diseases.

Dietetic surveys

'I am glad to think that under Dr. Aykroyd's expert guidance, within the last year or two, the scope of this work has been considerably increased and that it now includes dietetic surveys on an extended scale in different parts of India, the assessment of the nutritive value of articles of food in common use by the people, the formulation of objective standards for nutrition and the dissemination of knowledge regarding nutrition by free advice to institutions and by propaganda.

'Facilities have also been made available for selected officers from provincial departments of public health to undergo a special course of nutritional training at Coonoor—a course, the value of which, I am convinced, is great.

Training at Coonoor

'It is my earnest hope that those provinces which, owing to pressure on the existing personnel or for other reasons, were unable to depute officers to the first course of this nature will find it possible to take advantage of a further course which is now proposed to be held. I am convinced myself of the importance of providing trained officers for the provinces, who can be employed in the nutritional field, and I am confident that the fullest use will be made in that field by the Provincial Governments which have found themselves able in the past, or which may find themselves able in the future, to depute officers to Coonoor of the expert training which their officers have received there.

Co-ordination need

'A further step of substantial importance is that consequent on a recommendation of the Nutrition Advisory Committee, steps are now being taken to co-ordinate agricultural research with the needs of human nutrition. The problems of human nutrition are closely associated with those of agriculture and of animal husbandry and it is, in my judgment, a matter of the utmost importance that this association should be adequately recognized in terms of the organization of research.

Milk for children

'Let me refer briefly in this connection to one side issue, for though it is a side issue it is one of much significance and one to which I have endeavoured in the past to draw particular attention. I refer to the benefit to be derived by the feeding of children even with small quantities of milk, a benefit which has been more than established by the work of the Nutrition Research Laboratories at Coonoor.

'The results of those experiments, or to take one instance only, the effect of giving skimmed milk regularly to day and boarding school children, are remarkable indeed. When an ill-nourished child living on rice is given milk regularly it immediately begins to grow more rapidly and its general health shows an improvement.

'I fully realize that milk costs money and that the resources at our disposal are insufficient to enable us to go as far as we should like in this regard.

'To supply a child daily with eight ounces of liquid milk reconstituted from skimmed milk powder costs about 12 annas a month, a large sum in relation to living standards in India. Nevertheless, I am glad to see that a number of children's institutions have, by economies in other directions, managed to include greater quantities of milk in their diet schedules and I would like again to draw such attention as I may to the great importance of the use of milk and to its beneficial result on the younger generation and so on the future of India.

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Maternal mortality

Let me say a word, too, about the problem of aternal mortality, a problem of the first importance m the point of view of public health in India. ough no precise figures are available I am given to derstand that I should not be far wrong if I put the mber of maternal deaths at as high a figure as from 0,000 to 200,000 per year. The average combined nual mortality from smallpox and plague approx- ates to this figure, while the annual mortality from olera is not much higher.

I need say nothing of the disastrous consequences to health and happiness of the home when, as so equently happens, maternal mortality cuts off the other of the growing family.

Work at Calcutta

This whole subject has been under investigation in lcutta now for a year and during the present year a ilar investigation has been initiated in Bombay. e experience of Calcutta has shown that the anæmia sociated with pregnancy and eclampsia is responsible r a large proportion of maternal deaths. These are nditions which require much more detailed investiga- on than they have hitherto received and it would be great value if this work, the importance of which heartily commend to the generously minded, could further extended.

Toll of tuberculosis

'I come now to the problem of tuberculosis. Lady Linlithgow and I, ever since we returned to this country, have been watching the position in regard to this problem with the closest attention and I will frankly confess that we were both profoundly concerned to see the rapidly increasing toll which it is taking on the life and health of India and that we were profoundly impressed too with the necessity for taking the earliest possible remedial steps. There is no question that tuberculosis is one of the major public health problems of this country.

'Investigations carried out by the Tuberculosis Association of Bengal appear to suggest that in that Presidency alone there may be each year 100,000 deaths from this disease and that the number of persons infected may be so large as a million. What is more important again is that the greatest degree of infection occurs between the ages of 20 and 30 and in Calcutta—which I quote only because of the reliability of the figures available to me in respect of it—it is estimated that at this age period there are five times more deaths among females than among males.

Calcutta statistics

'I realize that there are many factors which go to make the control of tuberculosis difficult. I need only refer, in the first place, to the increasing facilities of motor transport which make for a rapid movement between urban and rural areas and, secondly, to the fact that industrial labour in India is largely drawn from villages and that contact with the rural areas is maintained by the factory worker, who, under the congested conditions of city life, is continuously exposed to infection.

'Researches have already been carried out under the auspices of the Research Fund Association which have helped to throw valuable light on some aspects of this problem, all the more important because the epidemiology of the disease appears in India to differ in some respects from that of Western countries.

'This work is still only at its beginning and epidemiological surveys on an extensive scale will be necessary before we are in a position to obtain an accurate picture of the tuberculosis problem. Let me, however, repeat that the problem is one of the utmost importance.

Appeal for funds

'I can say to-day that I hope there will be made on 1st December an announcement as to an appeal by my wife in connection with it, the response to which will be, I hope, nation-wide and such as to enable us to see in every province and in every state in India arrangements for the prevention and treatment of tuberculosis on a really satisfactory basis and to establish an effective barrier against the ravages of this scourge.'

STATUS OF TRAINED NURSES. LADY LINLITHGOW'S PROPOSALS. IMPROVING PROFESSIONAL EDUCATION

New Delhi, 30th November, 1937

IMPROVEMENTS necessary in the condition of work of trained nurses were pointed out by Her Excellency the Marchioness of Linlithgow when opening the 25th annual conference of the Trained Nurses' Association of India in Delhi on 16th November.

Her Excellency said:—

'I am diffident at addressing so expert a gathering, but I am anxious to show my interest in and sympathy with the objects of your association.

'I have felt very strongly since I have been in India that nursing as a profession was rather looked down upon by girls of good education. If they have a bent that way, they seem to feel that the surgeon's or physician's is the only profession to go for.

'There are, I think, one or two contributory causes to that frame of mind. At the moment a nurse has no recognized status and nursing, being put under the heading of "Medical Detail" in the health programme of the country, does not have the standing which it should have.

CONDITIONS OF LIFE NOT GOOD ENOUGH

'Another drawback I think is the fact that the quarters and conditions of life in many places are not good enough for one who is putting a constant strain, both mental and physical, on her constitution and who should therefore be given the best possible accommodation and the best possible food.

'A great many hospitals are under-staffed and it is all a probationer can do to get through the work which she has to perform and which does not give her a chance to nurse the patients and to practice the methods taught.

'I feel that the discipline of the female nursing staff should be entirely in the hands of the nursing superintendent and not in the hands of a medical man or woman—especially not in the hands of a man.

'I would like to see a greater development of the provincial nursing registration councils. At present there are nursing councils in many of the provinces, but the registrars are simply clerks who have no technical knowledge.

NURSE REGISTRARS

'I suggest that if fully qualified nurses are appointed as registrars, the nursing councils would be of far greater importance and value and those nurse registrars could conduct the inspection of hospitals which style themselves as nurse training schools.

'If this is done and if the nurse registrars are provided with adequate salary and given the necessary status, the regulation of training schools would follow, and a better professional educated woman would be the result.'

In asking Her Excellency to open the conference, Major-General E. W. C. Bradfield, Director-General, Indian Medical Service, expressed his gratitude to Her Excellency for agreeing to open the 25th Conference and for her presence.

He said:—

'Your great interest in all efforts which are being made to deal with disease and to improve health in India is well known to us; in these activities the value of trained organized nursing services is now very clearly realized and in none more than in the fight against tuberculosis with which we know you are so deeply concerned.'

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THE SECOND EUROPEAN CONGRESS OF PLASTIC SURGERY

THE European Society of Structive Surgery held its Second Congress in the Barnes Hall of the Royal Society of Medicine, No. 1, Wimpole Street, London, under the Presidency of Mr. T. Pomfret Kilner, on the 6th and 7th October, 1937. Delegates from most of the countries in Europe participated in the Congress. The President, in welcoming the delegates, hoped that the discussions during the Congress would greatly add to the advancement of plastic surgery. Sir Harold Gillies, the President of Honour, opened the Congress and Professor Clairmont (Zurich), the Vice-President of Honour, wished the Congress every success.

The subjects for discussion were divided into three sections:—

(1) Free skin grafts,
(2) The restoration of nasal contour, and
(3) Mammaplasty procedures.

Under each of these sections, there were opening papers and short communications devoted to special points in technique, followed by discussion and replies by earlier speakers.

On the morning of the first day, Dr. M. Coelst (Brussels), Dr. L. Dufourmontel (Paris), Dr. G. Sanvanero Rosselli (Milan) and Dr. F. Burian (Prague) presented opening papers on free and full thickness skin grafts. Professor Clairmont and Mr. G. Humby (London) presented short communications.

In the afternoon, Dr. Sanvanero Rosselli, Mr. A. R. Mowlem (London) and Sir Harold Gillies (London) contributed opening papers on restoration of nasal contour. Sir Harold Gillies' communication on his modification of restoration of nasal contour by intra-nasal skin grafts, illustrated by a coloured film, was very much appreciated. Mr. Mowlem's paper on 'Bone grafts in the restoration of nasal contour' and Dr. J. Thavanin's paper on 'Causes of intolerance of cartilage grafts' were interesting. Dr. J. Safian of New York spoke on 'An evaluation of rhinoplasty'.

The afternoon of the second day was devoted to mammaplasty procedures. Dr. F. Burian's paper on 'Our principles of mammaplasty' was read by Dr. Eva Kubertova. Mr. A. H. MacIndoe (London) reviewed on 80 cases of mammaplasty. A film showing Dr. M. J. De Lara's (Havana) method of mammaplasty was shown. Professor Essen, Professor Clairmont and Sir Harold Gillies took part in very interesting discussions throughout the Congress.

The delegates dined with the President and the President of Honour at the Langham Hotel on the night of the 7th October.

Operations were arranged on Friday at St. Andrew's Hospital, Dollis Hill, London, to demonstrate the various procedures discussed at the Congress. Dr. M. Coelst demonstrated his full thickness skin graft and his special method of dressing. Sir Harold Gillies grafted maternal ear cartilage to the child, and Mr. Kilner demonstrated the Eastern method of skin grafting in a case of ectropion.

THE IDEAL *CHAPATTI*

NUTRITION RESEARCH: ONE ANNA RECIPE

A RECIPE for a nutritious *chapatti* suitable for out-door workers in India, has been evolved by the Nutrition Research Laboratories at Coonoor.

A manual labourer needs at least two good meals a day. It is often impossible for him to return home to consume his midday meal and he cannot afford to eat in a hotel even if one were available.

The meal, therefore, which he takes with him, should be sufficient in quantity and well-balanced, that is, it should contain the essential nutritive elements in correct proportions. It should be cheap, made of easily obtainable foods, and be simple to prepare. It should be easy to carry, that is, it should be solid to avoid the possibility of spilling, small in bulk, and not require a special utensil to contain it, and should also remain fresh and palatable for a number of hours.

THE INGREDIENTS

Such a *missi chapatti* fulfilling all these con... may be made from the following ingredients:— Whole-wheat flour—10 oz. or 5 chataks, Bengal... flour—2½ oz. or 1¼ chataks, onions—¾ oz. or ... Fenugreek leaves (or any other green edible lea... ½ oz. or ¼ chatak, milk—1 oz. or ½ chatak, salt... or ¼ chatak, and ghee or butter—¼ oz. or ¼ chat... These constituents, except ghee, are mixed, ... being added and the whole kneaded into a d... *Chapattis* are made from the dough in the or... way, good thick *chapattis* being recommended, ... these remain fresh longer than the thin ones. S... quently ghee is smeared on the *chapattis*.

The weight of this meal is about 1 lb. or half a ... it will supply about 1,300 to 1,400 calories, wh... approximately half the daily requirement of a lab... and about 50 grammes of protein. The mixture ... tained in the *chapatti* is rich in vitamin and m... salts.

If fresh milk cannot be obtained, *khoa* or skim... milk powder can be used. For those who can ... it, the addition of a greater quantity of milk or s... to the dough is recommended.

Such a meal is easy to carry folded in a brow... or wrapped in paper. It remains fresh and pal... for a number of hours and can be eaten with no ... sories except water. Its cost is about 1 anna. I... be recommended for travellers and for picnic p... as well as for out-door labourers.

DR. JOSEPH BENJAMIN PRIZE AND DR. P. S. RAMACHANDRIAR PRIZE

NOTICE is hereby given that the subject for ... Dr. Joseph Benjamin prize of the value of Rs. 35 (r... thirty-five only) for the year 1937 is 'Puerperal s... its cause, symptoms, treatment and prevention'; an... the Dr. P. S. Ramachandriar prize of the value of R... (rupees twenty-five only) for the year 1937 is 'Cho... its prevention, causes, symptoms and treatment'.

1. All *bona-fide* members of the All-India Me... Licentiates' Association can compete.

2. Intending competitors are requested to w... papers from practical points and in lecture style ... the same should not exceed 1,000 typed lines or ... equivalent.

3. The papers should be sent to Dr. Jamiatra... Desai, President, Gujrat Branch, All-India Me... Licentiates' Association, 52, Pritamnagar, Ellis Br... Ahmedabad, so as to reach him on or before the ... March, 1938.

P. S. TRIVEDI,
Secretary, Gujrat Branch, Ahmed...

THE TINNEVELLY DISTRICT MEDICAL ASSOCIATION

THE Anniversary of the Tinnevelly District Me... Association has been provisionally fixed for celebra... on the penultimate Saturday in January 1938.

A medical exhibition will be held consisting ... surgical goods, medical appliances, drugs, etc.

Firms who are interested are kindly requested to ... in their representatives with articles. Stalls are g... free.

All correspondence on the subject should be sent ... the following address:—

Secretary, The Tinnevelly District Medical Ass... tion, Palamcottah.

K. RAMA AYYAR,
Secretary and Treasu...

A MALARIA CONTROL EXHIBITION

A MALARIA control conference and exhibition ... place on the 15th and 16th November, 1937, at ... All-India Institute of Hygiene and Public Health.

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object of this function was to remind the medical profession of the problems which malaria in all its aspects offers and how they may contribute their individual share towards malaria sanitation; it was arranged by the Scientific Department, 'Bayer', in co-operation with the All-India Institute of Hygiene and Public Health, the School of Tropical Medicine, the Public Health Department, Bengal, the Malaria Department, the Bengal Nagpur Railway, and the Zoological Survey of India.

The exhibition was formally opened by Dr. R. B. Lal, the Director of the All-India Institute of Hygiene. The exhibits were supplied by the Institute of Hygiene, the School of Tropical Medicine, and the Scientific Department, 'Bayer'. Further contributions were made by Dr. Manson, the chief medical officer, Jorehaut Tea Co., Ltd., Cinnamara, Assam, and by Mr. R. Senior White, the malariologist of the Bengal Nagpur Railway. The exhibition was composed in such a way as to give

by suitable plants as an effective measure in removing those vectors which breed in grassy-edged water exposed to sunlight, *e.g.*, *A. minimus* in Assam and Eastern Bengal. A number of instructive pictures and models showed the various forms of drainage adapted to the topography of the land.

Another part was devoted to the rôle of drugs, either alone or as a supplementary measure to larval control. The results of the Burdwan experiment over the last four years were given in graphs showing the fall in spleen rates, as well as the decrease in the number of sick days over these years. In this scheme plasmochin in small doses was added to every quinine treatment, in order to reduce the relapse rate and to interrupt the sexual cyclic development. Another set of graphs gave the recent experiment of Field and his co-workers, comparing the results of atebrin and quinine prophylaxis, with the author's conclusion that atebrin is superior to quinine, in so far as its effect on the

A corner of the exhibition.

an idea of the many and varied problems which are confronting malariologists, and urge at the same time a combination of all measures if a maximum of success is to be achieved.

The section of the Institute of Hygiene showed the various anopheline vectors and the life-cycle of the parasites in man and mosquito indicating in which way this vicious cycle can be interrupted. It was demonstrated how an individual may protect himself against the bites of adult anophelines by mosquito nets, protective clothing, screening of houses (a method which has been used successfully in other malarious countries but is still not much in favour in India), repellents such as citronella oil, etc. Another section dealt exhaustively with the various anti-larval measures, *i.e.*, by oiling and paris-greening. The natural enemies of larvæ, *e.g.*, larvicidal fish (among which in Bengal *Panchax panchax* seems to be the most active larvæ-feeder), were shown as live specimens with corresponding pictures to facilitate identification. The rôle of aquatic plants in preventing breeding was demonstrated. Prominence was given to the shading of breeding places

frequency and severity of attacks and on the reappearance of attacks after the cessation of the prophylaxis is concerned. Amongst further materials the recent experiment of the same type carried out by Mosna and Canalis in Italy was also represented.

Various suggestions were given as to how anti-larval measures could be supported by drug prophylaxis in those months of the year in which in a given locality the infection rate among mosquitoes is as a rule at its highest.

In the clinical section a number of typical charts of malaria patients treated with atebrin from various tea gardens in Assam proved of special interest to the practitioners who attended.

The formal opening of the exhibition was followed by the presentation of a film 'Principles underlying malaria control in India' taken by the Scientific Department, 'Bayer', in co-operation with a number of scientific institutes, giving a bird's-eye view of almost all measures at present adopted for combating malaria.

The lectures on the first day in the afternoon were preceded by an address of welcome by Dr. A. G. Brocke,

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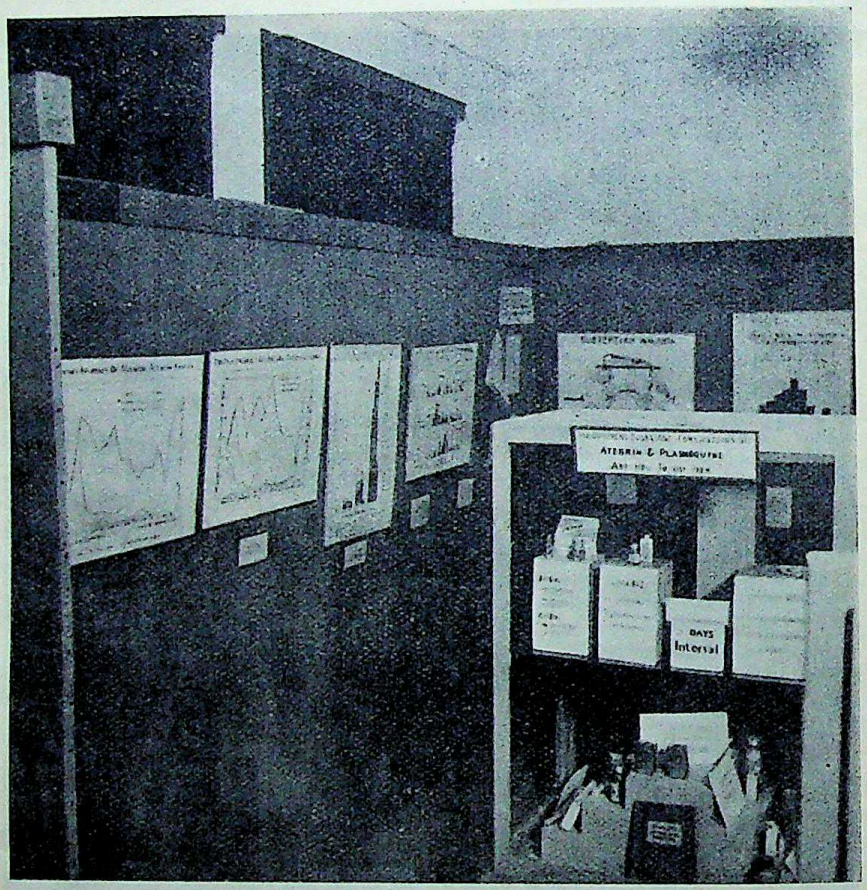
the Calcutta Manager and Scientific Adviser to Bayer's, in which he thanked those who had contributed towards bringing into existence the malaria control exhibition. He concluded his address by saying:—

'I would like to express here that the Bayer laboratories in realization of the complicated problem which malaria presents are only too willing to give their whole-hearted co-operation to any malaria control scheme which combines all methods adapted to the local conditions. To demonstrate this intention of Bayer's co-operation is one of the reasons which have prompted us to organize this malaria control conference under the advice of those scientists who are going to speak in these days. I may conclude in stating that we, of the Bayer's pharmaceutical department, including the directors and the investigators in our laboratories at home and those who are working out here as liaison officers, have only one feeling, that is, that we are not the representatives of an industrial organization concerned with the profitable sale of our products but that we have the same mission as any other research institute to contribute to the progress of medical science and thus to the welfare of mankind.'

Thereafter the chair was offered to Colonel Chopra who presided over the rest of the function, opening it with a lecture on 'Present position of anti-malarial drug therapy'. Discussing the anti-malarial drugs in general he said that of the four main crystalline alkaloids of the cinchona bark, quinine is still a very important factor in the treatment of malaria. Some proprietary remedies which he had tested were found to contain cinchona derivatives and did not offer any practical advantage over quinine.

Referring to the synthetic drugs he said that atebrin has an advantage over quinine in many respects, and that it was being used regularly in the Carmichael Hospital for Tropical Diseases with satisfactory results. He added that in all the years they have used it no by-effects of any kind had been noted. He also referred to Cilional, a new preparation of Bayer's, which he said has the same effect on gametocytes as plasmochin but is much less toxic. Colonel Chopra concluded that although atebrin is of great importance in private practice, for the time being quinine still holds its place on account of its cheap price and that therefore the cinchona plantations in India should not be abolished until synthetic drugs like atebrin can be supplied at a price allowing their use on a large scale.

Thereafter, Dr. K. V. Krishnan, the professor of malariology and rural hygiene of the Institute of Hygiene, spoke on 'The rôle of the synthetic drugs in the prophylaxis of malaria'. He gave an account of the action of atebrin and plasmochin and explained how their action could be made best use of in field measures. He concluded, after discussing the evidence so far obtained all over the world, both in the laboratory and in the field, that 'plasmochin and atebrin are drugs indispensable and invaluable in the prophylaxis of malaria'.



Another view of the exhibition.

Finally, Dr. Hora, the assistant superintendent of the Zoological Survey of India, spoke on the 'Larvicidal fishes in India in malaria control'. He enumerated the great variety of larvicidal fishes in India and stipulated that out of these species as a class the ones of the smaller size should be selected. They must be hardy so that they can bear the vicissitudes of the Indian weather, and should be able to breed in confined waters. They should be top-feeders and carnivorous and finally they must be of absolutely insignificant importance as food.

On the second day the exhibition was open again and at 12 noon another film on malaria taken by the Winthrop Chemical Co., Inc., New York, in co-operation with the State Board of Health, Georgia, was shown.

In the afternoon the chair was taken by Lieut.-Col. A. C. Chatterjee, the Director of Public Health, Bengal, who spoke first on the 'Economic aspects of malaria in rural life of Bengal'. He estimated that an average 30 to 40 million cases of malaria occur in Bengal every year, a vast majority of them in the rural areas, and the economic loss which the labourers suffer

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is not less than 2,25,00,000 rupees in wages alone, to which must be added the cost of treatment incurred. Lieut.-Col. Chatterjee strongly appealed for a co-ordination of efforts for a better control of malaria.

Referring to the synthetic drugs, atebrin and plasmochin, he stated that atebrin is at present suitable for private practice only, on account of its high price. For large scale measures however they had still to resort to the cheapest quinine preparations such as cinchona febrifuge in order to provide relief for a maximum number of people with the limited amount of funds that were available for the purpose. He stressed however that the addition of small doses of plasmochin to every quinine treatment was of eminent importance from a public health point of view and that such a 'combination of quinine and plasmochin has given so far the best possible result'. The dose recommended for the purpose is 6 tablets of 0.01 gm. plasmochin which have to be taken distributed over three days. This dose is quite sufficient to destroy the gametocytes present or at least render them non-viable, thus eliminating the source of infection for the mosquitoes. Besides, the total dose in this case was only 1 grain of plasmochin which when issued along with the usual quinine would not produce any severe by-effects, even if the illiterate villager swallowed the whole dose at a time instead of 2 tablets daily.

As far as Bengal is concerned, Lieut.-Col. Chatterjee dealt with the measures of control for combating malaria under seven main headings:—

(1) Stopping of further creation of well-known sources of breeding grounds.
(2) Repairing the damage already done.
(3) Diminution of human reservoir.
(4) Adopting a systematic and bolder policy of integral land reclamation or, in other words, bonification.
(5) Giving greater impetus to anti-malaria works by local bodies.
(6) Appointment of a Government fishery officer.
(7) Legislation.

and he specially urged the adopting of comprehensive measures on a permanent basis, including anti-malarial engineering measures, natural methods like pisciculture, etc. Nevertheless for giving temporary relief and reducing the mortality, especially in newly-affected areas, drugs have a definite value.

Then Dr. Napier, the professor of tropical medicine of the School of Tropical Medicine, spoke. He dealt with clinical experiences with atebrin and plasmochin from five different points of view, *i.e.* (1) true causal prophylaxis, (2) clinical prophylaxis, (3) the treatment of the clinical attack, (4) treatment to prevent or reduce the chances of relapse, and (5) gametocyte destruction in the cause of general prophylaxis. He said that no drug will effect (1), (2) can be brought about by the administration of 6 grains of quinine or 0.1 g. of atebrin daily, (3) by 0.1 gm. of atebrin daily for 5 days, or by grains x of quinine twice or thrice daily, (4) by a repetition of the course of atebrin after an interval of ten days and in the case of benign tertian infections by atebrin and plasmochin or of quinine and plasmochin and (5) by 1/6th grain of plasmochin twice daily for three days.

Dr. Napier also discussed in detail the by-effects of atebrin under the following headings: (*i*) the by-effects wrongly interpreted and wrongly attributed to atebrin (*e.g.*, jaundice which is really discoloration of the skin and sclerotics by the dye), (*ii*) by-effects that may possibly be attributed to atebrin, and are probably due to individual susceptibility, (*iii*) by-effects that undoubtedly are caused by atebrin; these are practically all mild but the physician should be ready for their appearance, and (*iv*) the possible enhancement of these by-effects by the combination of atebrin with plasmochin.

The third lecture was delivered by Mr. R. Senior White, the malariologist of the Bengal Nagpur Railway, on 'Species control in malaria' in which he dealt with engineering operations in malaria control. The physico-chemical factors underlying the breeding place preferences of various species have been investigated but very incomplete results have emerged to date. They seem to be related to the bacterial nitrogen-cycle in the soil underlying the water. Equally the meteorological factors favouring the development of the plasmodia to the sporozoite stage in the mosquito are incompletely understood. The 'malaria season' of a locality is now seen to be the resultant of the interplay of the biochemical factors favouring breeding of the larvæ of vector species with the meteorological factors favouring longevity in the adult. It is no longer, therefore, good malariology to use blanket methods against anopheles either in regard to species or to time. For incrimination of vectors extended local dissection is required. For further economy as regards the seasonal factor regular specific larval identifications ahead of the treatment rounds are necessary. The cost of the microscopes involved is amply covered in the first year by economy in larvicides.

The exhibition, film shows and lectures drew large numbers of visitors from the medical profession. The importance of such functions is obvious and the initiative taken by Bayer's in this respect therefore deserves appreciation. It is to be hoped that similar symposiums will be held again.

THE EXCISE CONFERENCE AT NEW DELHI

THE excise conference of provincial governments and the native states convened by the Government of India was held at New Delhi on the 8th November, 1937, to consider a number of questions on the excise policy relating to the spirituous preparations. This conference has just concluded its sittings. A number of important subjects of vital interest to the drug manufacturing trade and industry in India were discussed. The following are some of the chief items which were put up for consideration:—

1. Uniformity in rate of duty on spirituous medicinal and toilet preparations and on rectified spirit in all provinces and participating states.
2. Uniformity in rules for the import, export, etc., of spirituous medicinal and toilet preparations and Indian-made foreign liquor and uniform procedure for adjustment of duty thereon.
3. Adoption of a uniform normal spirit strength for all B. P. and other pharmaceutical spirituous medicinal preparations.
4. Unrestricted import and export of *duty paid* spirituous medicinal preparations (containing less than 20 per cent spirit).
5. Uniformity in procedure for testing samples.
6. Uniformity of rules framed by provincial governments under section 8(2) of the Dangerous Drugs Act, 1930, and uniformity of system of inter-provincial import and export passes in respect of intoxicants.
7. Uniformity of procedure for the denaturation of spirit throughout British India and arrangements for closer liaison between the customs and excise for control of imported spirits and spirituous preparations.

The conference owes its origin to the frequent representations made to the Government by various pharmaceutical concerns in the country to bring about a uniformity in the excise policy all over India. The biggest hindrance on the free movement of spirituous preparations from one province to another at present is the diversity of excise regulations in different provinces. Thus, for example, when spirituous preparations are exported from Bengal to Bombay, the authorities of the latter province refuse to accept the certificate of duty passed by the excise officers of Bengal and insist upon the goods being submitted for re-analysis for spirit content and re-valuation of duty by their own officers before they are delivered to the consignee. In the inland towns of the Madras Presidency, the druggists are not allowed to import spirituous preparations from another province in India, unless they obtain an import permit from the excise commissioner, assess the duty payable on the goods and pay the same in advance. The position has been further complicated during the last two to three years. Prior to 1934, there was a uniform duty of Rs. 5 per proof

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gallon in *all the provinces on all spirituous preparations*. Since then Bombay and Madras have raised the duty to Rs. 10 and Rs. 17-8 per proof gallon respectively for all imported spirituous preparations whereas the duty on local manufactures remained at Rs. 5 per proof gallon. Such regulations naturally hamper the inter-provincial trade in spirituous preparations considerably and further act as a potent incentive to smuggling.

In the interest of the pharmaceutical industry in India it is desirable that inter-provincial and inter-state barriers should be removed by the introduction of uniform method of excise control all over India. The are a number of technical difficulties to be considered but it is hoped that the conference will succeed evolving a simplified procedure which will facilitate free and healthy trade in spirituous medicinal preparations. Such a step will indirectly have an effect on the price of spirituous medicinal preparations which form quite a large part of the everyday prescriptions of medical practitioners.

Current Topics

Treatment of Malaria with Sulphonamide Compounds

(From the *Public Health Reports, U. S. Treasury Dept.*, Vol. LII, 15th October, 1937, p. 1460)

THE following is believed to be the first report on the use of sulphonamide compounds in the treatment of malaria. It is the translation of a report, by Dr. Amonario Díaz de León, of Cardenas, San Luis Potosi, Mexico, furnished by the Pan American Sanitary Bureau, and is to be published in an early issue of the Boletin, issued by that Bureau. This report is published here with the hope that a cautious use of the drug by others may determine whether or not it has real value in the treatment of malaria. As a matter of precaution, mention is made here that reports of idiosyncrasies to this drug are appearing in the literature and that it may not be free from toxic effects. The report follows:

FIRST CASES OF MALARIA TREATED WITH RUBIAZOL ROUSSEL *

In view of the discovery of plasmochin and atebrin after experiments with various colorants, and of the bacterial properties of such dyes as Rubiazol Roussel in streptococcic, staphylococcic, and gonococcic infections, Dr. Díaz de León decided to try it in the treatment of malaria, with such completely satisfactory results in his 15 cases of benign tertian malaria that he believes its antimalarial properties worth further investigation.

Dr. Díaz de León recalls that the treatment of malaria should be adapted to each individual case, after due consideration of the species of the parasite (*vivax, falciparum, malariæ*), its forms (schizont, gamete), the duration of the illness, and the therapeutic properties of the specific drugs—quinine and atebrin (schizontocidal) and plasmochin (gametocidal). The new antimalarial remedy would probably be classed with the former, since it was tried only in the benign tertian form. Dr. Díaz de León describes the first 4 cases of the 15 which he treated as follows:—

The first patient clearly suffered from benign tertian fever, as he underwent three fever attacks and the microscope revealed *P. vivax*. He was given several tablets of Rubiazol, with instructions to take six per day, two after each meal. Five days later he returned for consultation, feeling perfectly well, and having suffered no attacks during that period. He was advised to continue taking Rubiazol, one tablet after each meal, until one bottle had been used, and to report the results, which were excellent.

The second and third cases were in two brothers who had travelled together through a malarial region, and who suffered the first attack of fever on the same day. Before the treatment, an examination revealed *P. vivax* in the blood of both patients. Rubiazol tablets, two after each meal, were prescribed, for 4 days, then one tablet after each meal until the contents of one bottle had been taken. These two patients suffered only the initial attack, before treatment, and became perfectly well. Seven days after the first consultation an examination of the blood was made and no parasite was found.

The fourth case was in a woman coming from a malarial region. She had had an abortion, and 4 days later had suffered from general malaise, lack of appetite and headache. Three days following these disturbances she felt an intense chill, followed by a very high temperature, ending in copious sweat. This cycle of chill, high fever, and sweat was repeated every third day for six times, the last being one day before she came for examination. Though her diagnosis of 'calentura' was corroborated by the symptoms, I proceeded to make a blood smear, staining it with Tribondeau's formula as I had done in the other cases studied, and found unmistakable, abundant parasites of benign tertian. I immediately prescribed Rubiazol tablets according to the system followed in the other cases. On the day following the consultation, when the patient had begun treatment, the last attack appeared (on the day it was due), but lightly, since the chill was slight, the temperature rose only to 38°C., and disappeared in 3 hours, in contrast to the former attacks which lasted 8 or 10 hours. Because of this attack, on the morning following I gave an intramuscular injection of Rubiazol without stopping the tablets. The attacks did not return and 7 days after the beginning of treatment the patient returned home decidedly improved and taking only three tablets per day. On the twentieth day I had the opportunity of seeing her completely well. This case was the only one in which a second attack occurred, and even in that attack the effect of the Rubiazol was seen. It was also the only case in which I used this drug by injection.

After having treated 15 cases of benign tertian fever with complete success, I am sure that Rubiazol is an effective, specific drug for this form of malaria. I am waiting to experiment with it in other forms later on, since this year the late arrival of the rains has somewhat modified the incidence of malaria in nearby endemic regions.

* Rubiazol is the French name of one of the sulphonamide preparations.

Induced Epileptiform Attacks as a Treatment of Schizophrenia

By L. A. FINIEFS, M.D. (Paris), M.R.C.S. (Eng.)

(From the *Lancet*, Vol. II, 17th July, 1937, p. 131)

PSYCHIATRISTS have long recognized that in certain mental disorders improvement sometimes follows 'shocks'. In 1929 Nyirö and Jablonsky, reviewing the reports of the Budapest-Lipótmezo Mental Hospital, observed that in a number of schizophrenics remissions had followed attacks of epilepsy. In 1930 Müller reported two cases of catatonic schizophrenia which recovered after having epileptiform fits. These observations and the results of his own experiments promoted von Meduna to evolve a form of treatment by inducing fits artificially.

He first tried intramuscular injections of camphor in oil but these had to be discontinued because of the large dose required. Eventually, pentamethylenetetrazol, known as Cardiazol (Knoll), proved to be more

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practical and effective. He has since treated a large number of recent as well as chronic cases of all forms of schizophrenia, irrespective of antecedents, with very good results. No fatality, complications, or late sequelæ were observed. His conclusions are that the best results are obtained in early cases with 6 to 12 months of psychosis and in those that responded with strong fits to the minimum dose of cardiazol. A thorough physical examination is essential before treatment: it must include complete examination of urine, and estimates of blood sedimentation rate, blood urea, blood sugar, and blood pressure. All febrile conditions and pulmonary, cardiovascular, and renal diseases are absolute contra-indications.

The technique is simple. All previous medication, especially of sedatives, should be discontinued for a few days beforehand. Cardiazol is supplied in ampoules of 1.1 c.cm. solution, each containing 0.1 g. of cardiazol in 1 c.cm. It is injected intravenously once or twice a week, with at least two clear days between each injection. The patient, having had an enema the previous evening and no morning meal, is kept in bed and injected at 8 a.m. The initial dose should be 0.5 g. of cardiazol and if this dose does not produce a fit, it should be increased at the following injection by 0.1 g. until the fit-producing dose is reached. This is then repeated at subsequent injections. The highest dose reported is 1 g. The fit occurs ½ to 1 minute after the injection, lasts for about 2 minutes, and has all the dramatic appearance of a grand mal attack. At the onset of the fit, the tongue should be protected by placing a wooden wedge between the jaws. The patient remains dazed afterwards for a short time and restlessness may follow, but this is temporary and should not be controlled by sedatives. More often the patient falls asleep, and he should remain in bed for the rest of the day. Food should not be given for 4 to 5 hours after the fit because there may be vomiting. No other complications have been met with. The number of fits required varies considerably, the average however being 30. Remissions have been obtained with as few as 4 but in general if no mental change is noticed after 20 fits the treatment is stopped.

Epileptiform fits occur in hypoglycæmic coma during treatment with high doses of insulin, and although dangerous to life because of the status epilepticus that may set in, they are generally believed to have a beneficial effect on the mental condition. James, Freudenberg, and Cannon report that they have induced occasional epileptiform fits by injecting cardiazol into some of their patients undergoing high-dosage insulin treatment, on days when insulin is omitted; for the cardiazol fits are less dangerous than those of hypoglycæmia and may be used as a supplement.

Induced epileptiform fits, either alone or in combination with insulin coma, have been used at the Three Counties Hospital for several months with fairly good results. Although no imposing figures of recoveries can yet be produced and the treatment is very active and somewhat rough, no ill effects have been observed in carefully selected healthy young patients. The method appears especially beneficial in early psychosis especially the stuporose and catatonic.

Pneumolysis Combined with Extrapleural Pneumothorax and Oleothorax

By B. RHODES, M.B. (Glasg.)

(From the *Lancet*, Vol. II, 14th August, 1937, p. 377)

THIS paper has been written to describe a method of treatment of pulmonary tuberculosis which has been revived in recent years in Germany and which is arousing considerable interest on the Continent.

Since the value of artificial pneumothorax has been recognized, workers have tried to find means of collapsing the lung in cases where intrapleural adhesions prevent satisfactory collapse. This problem has stimulated the development of cauterization of adhesions and such operations as phrenic nerve paralysis, pneumolysis, and thoracoplasty.

Recently I had the opportunity of visiting Graf's clinic at Coswig, near Dresden, where the method of pneumolysis combined with extrapleural pneumothorax and oleothorax has been in use for three years. I also visited the tuberculosis hospital in Heidelberg where Schmidt has treated the largest number of cases. The value of the treatment in their hands is undoubted.

HISTORICAL

Pneumolysis combined with wax plugging has enjoyed a certain degree of popularity, chiefly on the Continent, since Baer introduced it in 1913. The quantity of wax which can be used is of necessity limited and the degree of collapse is not great. That this operation has not been used more widely is due to the fact that after a time the wax often begins to extrude itself. Other substances have been employed such as rubber, oil, pieces of rib, sponges, and adipose tissue, but their use has been short-lived. In view of its success intrapleurally, air was suggested and employed as a filling medium by Tuffier at the end of the last century. Any successes reported, however, appear to have been largely fortuitous. Great difficulty was experienced in preventing the air from escaping, thereby causing subcutaneous or mediastinal emphysema, and in preventing adhesion-formation with subsequent obliteration of the cavity. In 1932 Sebestyén reported a method of combining extrapleural pneumolysis with intrapleural pneumothorax, which resembles the method to be described in many respects. Zorini, with his 'apicolyse semplice', and Michelsson contented themselves with performing pneumolysis over the diseased area of lung without taking measures to maintain the collapse. As a method of treatment, therefore, extrapleural pneumothorax did not attract much attention until 1934, when Graf began to develop the method which is now in use on the Continent.

THE METHOD

It is probable that most of the pneumolysis which had been carried out in the past were extrafascial. Graf succeeded in freeing the lung from the chest wall in the layer between the parietal pleura and the endothoracic fascia and in filling the resulting space with air. His early results were so encouraging that he has continued with this method and has operated on more than a hundred patients in the last three years. Schmidt, impressed by Graf's work, has operated on a more extensive series of cases in the last two years, and has modified Graf's technique in some important details. Both Graf and Schmidt stress the importance of freeing the lung in the subfascial layer, as the cavity thus formed is lined with firm cellular tissue and hæmorrhage does not readily occur. In this layer it is usually possible to free the lung all round, including the mediastinal surface as far as the root, and indeed Graf has succeeded in performing a complete extrapleural pneumolysis. The walls of this space are sufficiently firm and elastic to allow of the maintenance of an artificial pneumothorax without using positive pressures. Should the space become smaller in spite of refills and threaten the re-expansion of the collapsed area before the end of two or three years, there still remains the possibility of maintaining the collapse with oil.

OPERATIVE TECHNIQUE

For details of the operation reference should be made to an article by Adelberger. Here I shall merely summarize the method at present used by Graf and Schmidt. They prefer local anæsthesia with 0.5 per cent novocain. The sitting position for the patient is used, support being provided by a special bolster and pillows. Through a paravertebral incision a piece of the third rib 5 to 6 cm. in length is resected. The intercostal nerve is cut. The correct layer is found by locating the

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parietal pleura and working first with the finger and then with a swab on a holder in the fascial plane, which separates easily with a characteristic crackling sound. Care must be taken to carry out the pneumolysis very gently and to avoid pulling any adhesions which may be attached to the ribs. The whole procedure is performed under direct vision, and to make this possible a special lamp which can be placed inside the wound is indispensable. The lung should be freed as far down as seems necessary, allowing ample margin for the inevitable shrinking in the size of the pneumolysis cavity. The mediastinal surface especially should be freed as far as the lung root if this is possible. If the pneumolysis can be carried out entirely subfascially, appreciable hæmorrhage will not occur. Occasionally slight bleeding is seen when the pleura is adherent to a rib. If there is bleeding of any severity it can be controlled without undue difficulty, as the whole operation is performed under direct vision. As the freeing of the lung takes a considerable time to complete, it is advisable to cover the lung, where already separated, with gauze swabs to prevent excessive cooling, and to control the mediastinum should the patient cough during the operation. When the lung has been separated to the desired extent there is a cavity occupying up to half of the hemithorax. The wound is closed by stitching the intercostal muscles as firmly as possible to prevent leakage of air. The subcutaneous tissue and skin are stitched in the usual manner. Graf leaves a small rubber de Pezzer catheter in the wound, attached to an apparatus for maintaining a constant zero pressure in the cavity, for 24 to 36 hours. Schmidt, on the other hand, closes the wound primarily, for he fears infection of the cavity.

After-care

The patient is radiographed immediately after the operation and the degree of collapse is clearly seen. At the beginning screening control is carried out daily to determine the frequency of refills. Soon after the operation a fluid level can be made out in the cavity. This consists of blood and serum, and as a rule gives rise to very little trouble. Occasionally the fluid has to be aspirated but it seldom returns. The technique of refills is exactly the same as with intrapleural pneumothorax, but a longer needle is usually required. Refills should be carried out through the space left after resection of the rib, for this area is anæsthetic. The swing of the manometer is considerably less than with intrapleural pneumothorax, and smaller quantities of air are sufficient to maintain the collapse; seldom more than 200 c.cm. are required. In a number of patients the pneumothorax can be maintained as if it were intrapleural. In some patients, however, the lung tends to re-expand in spite of refills. A condition then occurs comparable to obliterative pleurisy. In these cases both Schmidt and Graf fill the cavity with oil. They use Jodipin 20 per cent, but an oil containing bromine is at present being experimented with. The technique of filling the cavity with oil is the same as that of intrapleural oleothorax. The oil is best given at least a week after the initial operation, for then the walls of the cavity are firm and the possibility of rupture into the lung is minimized.

Complications

Complications during the operation are for the most part not serious. Immediate hæmorrhage can usually be controlled by means of electro-coagulation, since the whole proceeding is carried out under direct vision, as mentioned above. Small tears of the pleura have occurred, but have not caused any subsequent trouble. No cases of air embolism have been encountered. After the operation, subcutaneous emphysema is often met with, but it has never exceeded that normally met with after thoracoscopy. Neither Graf nor Schmidt has seen mediastinal emphysema. Delayed hæmorrhage has taken place but has been controlled in each case by aspiration. Infection of the cavity is very rarely encountered, but it is a possibility and is certainly more liable to occur when drainage is used. Schmidt has had no cases of infection since he began to close the wounds primarily. In the cases of extrapleural oleo[thorax] perforation of the oil internally or externally is presumably because the walls of the cavity have allowed to stiffen up sufficiently before the introduced. Spontaneous pneumothorax has occ in one case of Schmidt's.

Indications

The indications are the same as for an intrapl pneumothorax; that is to say, relatively fresh in tion with cavitation and early infiltration whi tending to spread but cannot be controlled intrapleural pneumothorax because of adhe Sanatorium treatment with adequate rest should course be tried first, and the intervention should be carried out if the disease still shows signs of act Owing to its selectivity, almost no normal lung is put out of action as almost always happens intrapleural pneumothorax; therefore it is of us patients with poor air reserve or in cases with bil apical lesions. It may be substituted for an i pleural pneumothorax when the collapse obtained this is non-selective owing to adhesions too exte to be cauterized. An intrapleural pneumothorax w is controlling disease of the middle or lower l although not exerting any influence on the upper may be combined with extrapleural pneumothora make the collapse effective.

Cases with large apical cavities and old stiff-w cavities with much fibrosis and displacement of mediastinum are unsuitable for this treatment, for require permanent collapse measures. If for a reason the immediate condition of the patient is pneumolysis might occasionally be considered preliminary to thoracoplasty. Both Graf and Schm consider that thoracoplasty is rendered easier pneumolysis. In cases of long-standing apical dis it may be impossible to carry out pneumolysis bec of adhesions which have formed between the pl and the surrounding tissue. Partial thoracoplasty w then have to be considered.

Results and conclusions

In three years since this operation was started, 300 patients have been operated on. Complete st tics are not yet available. In November 1936 Schm reported three fatal cases out of approximately operated on. Graf early in 1937 reported seven de in 107 cases; all seven occurred in the first 40 cases, in the last 67 there has been no mortality. In instance could death be ascribed to the operation it

It will be evident that sufficient time has not ela for the late results of the operation to be asse The ultimate fate of the patients in whom an ex pleural pneumothorax has been induced will be wate with interest, for on this will depend the future of operation. There is undeniably need for a method treatment less drastic than thoracoplasty for many c in which artificial pneumothorax is indicated but can be carried out. Extrapleural pneumothorax has b evolved in the hope that it will help to meet this n Graf's and Schmidt's experience seem to justify wider trial.

Reviews

PROGNOSIS. VOLUME II. 1937.—Published The Lancet Limited, 7, Adam Street, Adelp London. Pp. xx plus 410. Obtainable fr Messrs. Butterworth and Company (India), Limi (Publishers), Calcutta. Price, Rs. 7-14.

PROGNOSIS is undoubtedly a neglected subject. wrong to say that when the practitioner is faced the problem of giving a prognosis he has nowhere turn to find the information he requires. All t textbooks of medicine give a short section on progn and there is at least one very valuable 'dictionary

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PROC. ROY. SOC. MED. JANUARY, 1937. p 276

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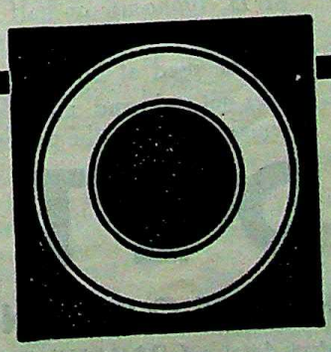

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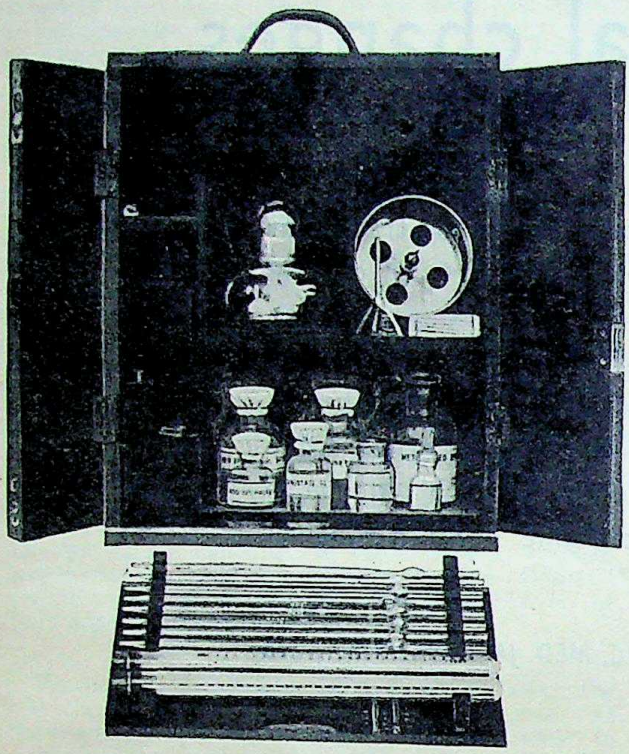

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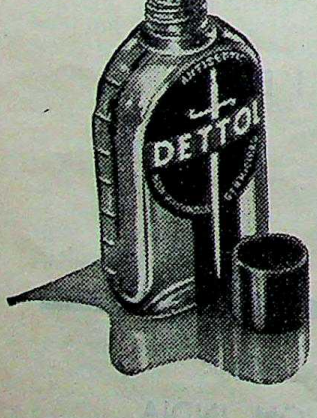

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prognosis. Nevertheless, there was room for the series of excellent articles on prognosis published in the *Lancet* during the last few years and the publication of the second series in book form will be a matter of considerable satisfaction to many practitioners.

The standard of the articles in this volume is quite up to that of the first series, and the subjects with which they deal appear to be equally important. Not many tropical diseases are dealt with but those that have been selected for inclusion have been fortunate in their exponents: Dr. Ernest Muir contributes the chapter on leprosy and Dr. Hamilton Fairley that on sprue.

The promising-sounding chapter on prognosis in enlargement of the spleen was a little disappointing to us as the author started by stating that tropical conditions would not be considered, though from other points of view it was excellent. The writer, Professor McNee, who is a world authority on the spleen and its functions, says that in chronic myeloid leukæmia the good, if temporary, results of *x*-ray treatment are obtained when exposure is directed *to the spleen alone* (his italics); this is in keeping with the reviewer's experience. On the other hand the reviewer cannot agree with the figure 300,000 per c.mm. as the normal level for platelets.

The book will prove a very valuable addition to the practitioner's handy reference library.

L. E. N.

MODERN TREATMENT IN GENERAL PRACTICE. VOLUME III.—Edited by C. P. G. Wakeley, D.Sc., F.R.C.S., F.R.S.E. 1937. The Medical Press and Circular (8, Henrietta Street, Covent Garden, W.C.2.), London. Pp. xii plus 436, with 54 figures. Price, 10s. 6d.

THIS is the third volume of that most important series of articles which appeared in the pages of our valuable contemporary *The Medical Press and Circular*. The papers were written for the practitioner and are essentially practical. In some instances the titles suggest a subject which is beyond the scope of the ordinary practitioner, but here the articles are written with the object of telling the practitioner what can be done and helping him to assess the chances of his own patient: examples of this type of article are those on treatment of hare lip and of cancer by radium and *x*-ray, respectively. The writers are all well-known physicians or surgeons at large hospitals in Great Britain and are for the most part teachers.

The treatment described is usually orthodox in principle though by no means textbook transcript, and, if it is new, it is usually well tried and seldom controversial. The chapter on the histidine treatment of peptic ulcer is possibly an exception to this rule; nevertheless, the writer gives a fair presentation of the case and the fact that he suggests that if the symptoms do not abate within 14 days then further investigations should be carried out, at least insures that little harm will befall the patients of anyone who follows his recommendations; even if the treatment does them no good, and there are some workers who doubt if its action is anything but psychological.

It is difficult to select any article for special praise as the standard throughout is very high, but Sir Humphrey Rolleston has dealt with the difficult subject of cirrhosis of the liver in a very masterly manner. We note that some subjects have been duplicated; there is, for example, another article in this volume on asthma, a subject that was dealt with by another writer in the second volume of the series.

The three volumes will form a very valuable addition to the general practitioner's library.

L. E. N.

PATHOLOGICAL PHYSIOLOGY AND CLINICAL DESCRIPTION OF THE ANÆMIAS.—By W. B. Castle, M.D., S.M. (Hon.), and G. R. Minot, M.D., S.D. (Hon.), F.R.C.P. (Edin.), (Hon.). Edited by H. A. Christian, A.M., M.D., LL.D., Sc.D. (Hon.). Oxford University Press, New York. Pp. ix plus 205. Price, 15s. Obtainable from Oxford University Press, Bombay and Calcutta

MINOT and Castle are two names that stand very near the top of the list of workers who have played outstanding parts in the very important advances that have taken place in the study of blood diseases during the last few years. It was a matter of great importance that their collected views on the subject of the anæmias should be made available to a wider medical public than they would be if they remained only as a section of a medical encyclopædia that has not a very wide circulation outside the United States of America. We therefore welcome the publication as a separate volume, by the Oxford University Press, of this important contribution to medicine.

The early sections of the book make very attractive reading and their interpretation of the physiology of the erythron is clear and convincing. The section dealing with diagnostic methods is concise and useful, but not of course exhaustive.

The classification that they have suggested is in keeping with the modern tendency. They have however only adapted two major groups, the first being 'anæmia due to blood loss or increased blood destruction'; the two causes here seem to be so essentially different that most hæmatologists have separated them, but the authors justify this classification on the grounds that in both cases there is physiologically hyperactivity of the bone marrow, whereas in all other anæmias there is hypoactivity; this claim also seems to call for explanation, though it may be true from some points of view.

The descriptions of the various types of anæmia, in which the authors naturally follow their own classification, are in some ways disappointing, as they do not seem to be complete, either from the clinical or from the hæmatological point of view. There is seldom any clear-cut blood picture given and, whilst it is true that the blood picture is liable to variations in most conditions, a little judicious dogmatism would have been welcomed by the class of reader for which the book was originally designed. There are also a number of loose statements, such as 'tetanic symptoms, probably due to loss of calcium in the stools'. It is not at all clear how their pernicious anæmia of pregnancy differs from Wills' anæmia, or even if they themselves consider it different.

There is an invaluable bibliography consisting of 646 references with the title of the paper given in each instance; this makes a bibliography so much more useful and only in the interest of space, which however is often a primary consideration in a medical journal, should they be omitted.

In conclusion, it may be said that the book is a most important contribution to hæmatology and will prove invaluable to the specialist and research worker. We do not however think that it is the ideal book for the student or practitioner, and we consider the subject-matter much more suited to its present form as a separate book than to a section in an encyclopædia of medicine.

L. E. N.

WHEELER AND JACK'S HANDBOOK OF MEDICINE. —Revised by John Anderson, M.D., F.R.F.P.S. (Glas.). Tenth Edition. 1937. E. and S. Livingstone, Edinburgh. Pp. xvi plus 703. Illustrated. Obtainable from Messrs. Butterworth and Company (India), Limited (Publishers), Calcutta. Price, Rs. 8-8

'WHEELER AND JACK' has been in existence for forty-three years and is too well known to require any introduction. The present edition, revised by John Henderson, has undergone a number of alterations, modifications, and additions, which have been necessitated by advances in knowledge. In order to keep the

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size of this volume within limits, certain parts, *viz,* the section on immunity, have been omitted.

The arrangement follows more-or-less orthodox lines and practically the whole range of general medicine is included. The various diseases are dealt with concisely, and the book provides a good summary of medical knowledge and practice.

A few sections are insufficiently detailed, for instance, hepatic puncture has been regarded as practically the only method of diagnosis in kala-azar, and information about the use of synthetic drugs in malaria is too meagre. Despite the advances in our knowledge of anæmia, the old classification of primary and secondary forms has been still mentioned. The Mantoux test has not been mentioned in the diagnosis of tuberculosis.

Otherwise, the book is a valuable one and has an impersonal quality. Students, especially in the medical schools of India, can safely turn to it as a reliable and lucid guide.

R. C.

RECENT ADVANCES IN THE STUDY OF RHEUMATISM.—By Frederic John Poynton, M.D., F.R.C.P. (Lond.), and Bernard Schlesinger, M.A., M.D. (Camb.), F.R.C.P. (Lond.). Second Edition. 1937. J. and A. Churchill, Limited, London. Pp. x plus 380, with 51 illustrations. Price, 15s.

THE subject of rheumatism in its varied aspects has resulted in the development of such a vast literature that it is difficult to keep pace with it. The appearance of the second edition of this book in the *Recent Advances* series is therefore welcome. The volume affords an excellent review of all recent publications with adequate discussions and comments.

After an introductory note on nomenclature, the authors have adopted a classification dividing rheumatic diseases, as simply as possible, into acute rheumatism, particularly that affecting children, and into chronic rheumatism which has been subdivided into rheumatoid arthritis and osteo-arthritis.

Recent investigations do not seem to promise the discovery of any one outstanding predisposing cause, but rather a combination of many which tend to lower the general health. Most authorities favour the view that damp is a decided factor in rheumatism, although the evidence collected by the Medical Research Council Committee throwing doubt upon this idea cannot be overlooked.

Elaborate histological examination of the pathological lesions in the acute condition has now shown that the Aschoff node, regarded almost universally as the hallmark of the disease, is in reality only a stage in the pathological process. It is not the essential lesion in the myocardium; rheumatic infection has direct toxic action on the cardiac muscle fibres. The widespread distribution of inflammatory rheumatic foci throughout the vascular system is now generally recognized. No striking new discovery has been made concerning rheumatic nodules and the reason for their presence in some cases and their absence in others is still a mystery. The bacteriology of acute rheumatism still remains a controversial problem. A chapter is allotted to electrocardiography describing how early suspected lesions can be confirmed. Preventive, immediate and convalescent treatment have been clearly described and the importance of prolonged rest is stressed. The chapter on acute rheumatism in childhood has been brought up to date and a new one written, devoted to the industrial aspect of rheumatism which is becoming of increasing importance. There is no reference of sympathectomy for the relief of pain in certain cases of rheumatoid arthritis, possibly because the operations of this type do not affect the underlying disease process.

The number of illustrations has been increased; some of these are of outstanding interest. There are references to the literature at the end of each chapter. The get-up of the volume is excellent as would be expected of Messrs. J. and A. Churchill. The book should be in the possession of practitioners and senior medical students.

R. C.

ELECTROCARDIOGRAPHY.—By C. C. Maher, B.A., M.D. Second Edition. 1937. Baillière, Tindall and Cox, London. Pp. xvi plus 254. Illustrated. Price, 18s.

CRITICISM has often been made that our practice of medicine is becoming too mechanized. If the machine serves as a corroborator of clinical observations, and not as the sole means of making the diagnosis, such criticism is not justified. This conclusion applies to electrocardiography that has now been established as a standard part of cardiovascular diagnosis. The publication of another edition of Dr. Maher's treatise within two years shows its popularity.

The book begins with a brief résumé of the modern clinical concepts of cardiovascular disease, conducting system of the heart, electrocardiograph and the fundamental principles of the electrocardiogram. Next, it deals with the arhythmias and conduction deformities which comprise over a hundred pages. This is followed by sections on axis deviation, coronary disease, drug effects, clinical syndromes, and diagnosis. The last chapter gives an outline on the routine interpretation of electrocardiograms.

The book is a practical one with a lucid style and characterized by brevity. Illustrations are profuse and vivid. There are diagrams and anatomical sketches to show the relationship of the electrocardiogram to the Purkinje system. A large number of tracings have been reproduced with regular tabulated interpretations actually done in the laboratory, so that even a novice can follow them.

It will serve as a very useful reference book for practitioners and students.

R. C.

THORACIC SURGERY: A REVISED AND ABRIDGED EDITION OF SAUERBRUCH'S DIE CHIRURGIE DER BRUSTORGANE.—By F. Sauerbruch and L. O'Shaughnessy, F.R.C.S. 1937. Edward Arnold and Company, London. Pp. viii plus 394. Illustrated. Price, 50s.

THIS book, consisting of 360 pages of text, puts the present position of thoracic surgery very clearly. It is now nearly ten years since Sauerbruch first published his *Die Chirurgie der Brustorgane,* and the advances made in recent years together with the increasing interest in the subject have prompted the authors to present this revised and abridged edition in English. The hope is expressed by the authors that a more general understanding of the principles of this branch of surgery by those indirectly concerned, *viz,* the physician and general surgeon, will benefit many more patients than is at present the case. This is a worthy belief which the book should do much to fulfil. The senior author, Sauerbruch, is one of the pioneers in thoracic surgery, and his immense experience is reflected in the quiet authority with which the book is written.

It is printed on excellent paper and adequately illustrated. The first 32 pages are devoted to chapters concerned with general principles. It then proceeds in orderly sequence to deal with everything affecting the thoracic cage and its contents, ending finally with an appendix on the surgery of cardiac ischæmia. There is at the end of the book a very complete and up-to-date bibliography, and an authors' index. Nothing of importance has been omitted and even the rarest surgical conditions affecting the thorax receive attention.

The introduction of case histories to illustrate the method adopted in dealing with particular types of case is very effective and greatly enhances the value of the book.

In all operations within the cavity of the chest general anæsthesia is considered essential because of the danger of reflex disturbances, and of the anæsthetic available ether given under positive pressure is considered the method of choice. Gas and oxygen are never employed. It is noted that there is no mention of spinal anæsthesia. For operations on the chest wall local anæsthesia is preferred, except perhaps in very nervous patients where psychological dangers have to be considered.

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In a book otherwise so complete, the reviewer feels that perhaps a little more detail might have been given to the treatment of empyema. For example, the details of intercostal drainage after the manner of Bülau are said to be shown by figure 46, which really only shows a tube draining the chest. In the same paragraph blowing fluid from one Wolff bottle to another is recommended as a method for bringing about expansion of the lung on the affected side. Is this method of much value? Again in the discussion of thoracostomy with rib resection the depth to which the drainage tube should be placed is not given, although it is stated that 'the drain may be shortened as time progresses'. At what intervals of time and by how much? Irrigation also as a method of treatment does not receive much mention.

Sauerbruch prefers two-stage lobectomy, inserting at the first operation a paraffin-wax plombe. We are not told how long after the insertion of the plombe the second stage is carried out. The technique of plombage which finds some favour in the Sauerbruch clinic is otherwise very fully dealt with. Surely the value of postural treatment for lung abscess and bronchiectasis, and especially its use as a preliminary to lobectomy, for the latter condition would justify a more detailed description?

A very full account of diseases of the thoracic œsophagus and their treatment is given but it is observed that Knight's work in connection with the relief of cardiospasm is not mentioned, nor is Grey Turner's operation of excision of the œsophagus for carcinoma.

These are minor criticisms, and there is no doubt that this book is a valuable addition to the literature on the subject of thoracic surgery. It is strongly recommended to all general surgeons and physicians, for the close co-operation of physician and surgeon is nowhere more essential than in diseases affecting the thorax.

F. A. B. S.

ELEMENTS OF SURGICAL DIAGNOSIS.—By Sir Alfred Pearce Gould, K.C.V.O., C.B.E., M.S., F.R.C.S. Eighth Edition, revised by Eric Pearce Gould, M.D., M.Ch. (Oxon.), F.R.C.S. (Eng.). 1937. Cassel and Company, Limited, London. Pp. xv plus 718. Illustrated. Price, 10s. 6d.

THIS little book needs no comment on its usefulness to students entering the surgical wards. The book appeared a little more than fifty years ago and the fact that, notwithstanding many similar publications since it first saw light, it has held its own during the last half century is an ample proof, if any proofs are needed, of its popularity among students and young practitioners.

The present is a revised edition, coming in after a lapse of eight years. An earlier issue of the edition must have been missed by many. Advances in surgical pathology and application of advances in radiology for diagnosis, made during the last decade, necessitated some alterations and readjustments especially in regard to nomenclature to bring the book up to date. We would have, however, been happier to see 'benign giant-cell tumour' used in place of 'osteoclastoma' and should think that the use of 'neuroma fibroma' has remained due to inadvertence.

A wider application of radiology in diagnosis has also been stressed. Many new plates have replaced old ones and in this we agree with the author's remarks that 'the present series will prove easier to interpret'. But for this, the scheme and scope of the book remains the same. There is little doubt that in the present edition will be found the same skilful collections of essential details for diagnosis to enable the present generation of teachers in surgery, of all the English-speaking nations, to recommend the book as a sound and comprehensive compendium, suitable to students and young practitioners; although we are confident that the book will also be read with interest and profitably by a wider and more senior section of medical men and women.

We, however, feel constrained to say that in the matter of printing, in the plates and get-up of the book, we could not find any subject for congratulation. Indeed, it is disappointing to see that such valuable material should have been so poorly printed. It is surprising that many of the defects were not remedied during the proof reading.

S. C. S.

DEMONSTRATIONS OF PHYSICAL SIGNS IN CLINICAL SURGERY.—By H. Bailey, F.R.C.S. (Eng.). Sixth Edition. Revised. 1937. John Wright and Sons Limited, Bristol. Pp. xii plus 284, with 358 illustrations, some of which are in colour. Price, 21s.

THIS, the sixth edition of a book which first appeared in 1927, has in its present form been fully revised, certain parts of the text having been recast and rearranged so as to render the student's task even easier.

There is otherwise little change from preceding recent editions. The book is well on the way to becoming a hardy annual and this no doubt is a reflection of its great popularity. That its popularity is richly deserved can readily be appreciated, as it is one of the finest books on clinical surgery in the English language. None of the important clinical signs is omitted, it is concise and always to the point.

All medical undergraduates at the commencement of their clinical training are strongly advised to buy and study this book. They can be assured of full value for their money.

F. A. B. S.

CANCER AND DIET: WITH FACTS AND OBSERVATIONS ON RELATED SUBJECTS.—By F. L. Hoffman, LL.D. 1937. The Williams and Wilkins Company, Baltimore. Pp. xx plus 767, with 15 illustrations. Price, $5.00. Obtainable from Messrs. Baillière, Tindall and Cox, London. Price, 22s. 6d.

DR. F. L. HOFFMAN, the expert in vital statistics, in his campaign against cancer has produced a scientific survey of the subject of cancer and diet. The results have been stated statistically under each food or group of foods through analysis of 2,234 questionnaires obtained by interviews with cancer patients at hospitals in several American cities, and 1,149 questionnaires for non-cancerous controls. The work is divided into four sections the first of which is an extended review of the literature on the subject. The array of opinion presented reveals an amazing amount of contradictory theories and results. Some advocate vegetarian diet, while others emphasize high-protein diet as a preventive and possibly curative measure. Most writers, however, are agreed that excessive nutrition, if not the chief cause, at least is a contributory factor of the first importance. The evidence put forth is contradictory to the recent views of Lochart-Mummery—'Various suggestions have been put forward that the incidence of cancer is related to certain foods, or absence of foods, but there is no evidence whatever to support such an idea, and a very great deal of evidence to refute it'.

The second section is a statement of the essential statistical facts of food consumption and the changes which have occurred during recent times to illustrate the growing tendency toward the use of modified or changed food products in contrast to the more natural foodstuffs of former years. It is held that these changes have introduced many dangerous factors, the nature of which is, as yet, not very clear. The author is, however, convinced that the chief cause of cancer in our modern civilization is the increasing urbanization of the people consuming modified substances, as a rule, in excessive quantities and more or less unnatural conditions of existence.

The third section deals with cancer metabolism as it is affected by various organic and inorganic food compounds. This applies particularly to the question of alkalosis and acidosis, to vitamin deficiency or excess, to mineral salts, to excess of animal proteins and to carbohydrates.

The fourth section represents the more general facts concerning cancer patients and non-cancerous controls secured by the questionnaire method. For instance, it is shown that constipation prevailed more in cancer patients than in controls.

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The statistical conclusion reached is that a principal difference between the cancer patients and the controls is the quantitative and qualitative richness of the diets of the former. Although it may not be universally accepted, the accumulation of data in this book is commendable.

R. C.

DISEASES OF THE EYE: A TEXTBOOK FOR STUDENTS AND PRACTITIONERS.—By Eugene Wolff, M.B., B.S. (Lond.), F.R.C.S. (Eng.). 1937. Cassell and Company, Limited, London. Pp. xi plus 234, with 120 text illustrations and 5 coloured plates. Price, 15s.

IN the last few years so many small textbooks on diseases of the eye for the use of students and medical men have been published that one wonders at the appearance of yet another. The book consists of 225 pages divided into 24 chapters, 120 figures and 5 coloured plates.

There is nothing new in the subject-matter, but one is impressed by the number of anatomical drawings which very rightly places emphasis on the importance of a sound knowledge of anatomy in the study of ophthalmology. These are excellently produced but are mostly standard ones, although the author has taken credit for their originality in many cases.

The treatment of trachoma and its sequelæ are open to criticism. Few will agree that daily paintings with 2 per cent silver nitrate are necessary when less painful applications are equally efficacious. To the experienced ophthalmologist the only satisfactory treatment for cicatrical entropion is the Webster's mucous-graft operation. Few will agree that an iritis occurs in most cases of cataract extraction and that a general anæsthesia is necessary for the removal of a post-operative iris prolapse. The importance of facial akinesia and its technique have been unfortunately omitted, likewise pre-operative hypnotics. The author will indeed be fortunate if he can get patients to remain in bed for 10 to 12 days after the removal of a cataract and it is hardly necessary to do so after three days.

The book is well written, profusely illustrated, and its teaching orthodox.

We can strongly recommend it as a useful and thoroughly practical book for students and medical men working in India.

E. O'G. K.

THE RÔLE OF CHEMIOTAXIS IN BONE GROWTH.—By A. P. Bertwistle, M.B., Ch.B., F.R.C.S. (Edin.). 1937. Henry Kimpton, London. Pp. xii plus 59, with 32 illustrations. Price, 8s. 6d.

THIS is a small book but it embodies an interesting and novel idea in connection with bone formation. This subject has been in the past, and still is, a matter for speculation, but the problem remains unsolved all the same. The theory advanced by the author of this volume will therefore be an interesting addition to it.

The object of this book is to describe what the author has chosen to call 'disruptive chemiotaxis', *i.e.*, 'the power of certain substances of attracting and drawing into themselves certain soft, living structures'. With the help of such a process, which however is new to medicine, he wants 'to lay down a law which, based on histological grounds, will be found to cover the whole field of bone pathology, *viz*, that whenever young fibrous tissue, particularly young blood vessels, come in contact with bone or a calcified deposit, new bone formation occurs'. It must be confessed however that though these terms are quite attractive the perusal of the book does not carry much conviction and it gives one the impression that their introduction to scientific literature is hardly justified.

The book contains some good descriptions of the histology and development of bone and a fairly good account of the relation of the periosteum to bone growth. The chapter dealing with ectopic bone formation may also be read with interest. At the end of each chapter there is a list of references which are fairly comprehensive. The paper, printing and execution of the diagrams are all very good.

It is somewhat difficult to know exactly the aim of the writer in publishing a book of this nature. The descriptions are too short and sketchy in char... and in some places not up to date. The use of ... words myeloma for giant-celled tumour (osteoclast...) and endosteal and periosteal sarcoma for osteog... sarcoma cannot be taken as very modern. But in ... of all these drawbacks the writer is to be congratul... for the ingenuity of his ideas and the book should ... read by all who may be interested in the subject ... osteology.

M. N. D.

DRUGS AND GALENICALS: THEIR QUANTITATIVE ANALYSIS.—By D. C. Garratt, B.Sc., Ph... (Lond.), F.I.C. 1937. Chapman and Hall Limi... London (Henrietta Street, W.C.2). Pp. xiv ... 422. Price, 25s.

As the name indicates, the book deals only with ... quantitative analysis of drugs and galenicals. ... drugs have been arranged alphabetically and the ge... scheme adopted is that used in the *British Pharm... ceutical Codex*. The principle involved in each met... has been shortly explained, and this is followed by ... concise but clear description of the experimental det... The reference to the original papers completes ... monograph on each substance.

The methods given in *British Pharmacopœia* ... have been avoided unless they are of general applica... The author has supplemented most of the methods ... additional explanatory notes which make them ... valuable to workers who have not attained suffici... experience. Alternative methods, depending u... entirely different principles, have been suggested ... enable one to check his results wherever possible, ... of the published methods only those which showed ... inherent weaknesses and were found to be based ... sound scientific principles have been included. Separ... sections have been allotted to fixed oils and fats ... essential oils, and there are some useful appendices.

The wide experience of the author in this branch ... thus enabled him to collect a large fund of use... material in a concise volume. The determination ... small quantities is claimed to be a new feature in ... monographs and the manual should therefore be use... to those engaged in toxicological work. The bo... should prove extremely valuable not only to analy... engaged in the examination of drugs and galenicals ... also to various research workers in the wider field ... plant products of scientific and economic importance.

S. G.

CHEMICAL METHODS IN CLINICAL MEDICINE: THEIR APPLICATION AND INTERPRETATION WITH THE TECHNIQUE OF THE SIMPLE TESTS —By G. A. Harrison, B.A., M.D., B.Ch. (Cantab.), M.R.C.S. (Eng.), L.R.C.P. (Lond.). Second Edition. 1937. J. and A. Churchill, Limited, London. Pp. xi plus 585, with 3 coloured plates and 86 illustrations. Price, 21s.

A QUARTER of a century ago the chemical pathologist was a novelty, even on the staff of a general hospital, and we remember the lifted eyebrows when the predecessor to the author of the book under review was appointed to one of London's largest hospitals. Times have, however, changed and the help of the chemical pathologist, or biochemist as he is now more often called, is more important to most physicians than that of the bacteriologist. Nor do we believe that he has yet reached the peak of his usefulness.

The great advances that have been made during the last seven years have necessitated complete revision and considerable expansion of this book. Amongst the sections that have been revised is that on the van den Bergh test: the old cut-and-dried explanation of the 'direct' and 'indirect' reaction—'non-direct' would be a better term, the author considers—is given, but rather as a matter of history and without any conviction that it is the right one—in fact with a fair degree of certainty that it is not. For practical purposes he considers the 'indirect' test one of considerable value, but the 'direct' one liable to misinterpretation.

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The description of gastric analysis is very clear and there are some helpful 'tips' which other books usually omit; there is also a useful table of the gastric findings in different conditions. Uffelmann's test for lactic acid is given. The next paragraph opens with the statement that 'qualitative tests for lactic acid are unsatisfactory'; it seems probable that this is a misprint for 'quantitative'.

Fouchet's test for bilirubin in the urine is given and is illustrated by a coloured plate.

A few important references are given at the end of most of the chapters; this is a point where more completeness would be welcomed by, we believe, most readers.

On the whole it is a very practical and generally useful book which we can strongly recommend to both physicians and biochemists.

L. E. N.

FLUORINE INTOXICATION: A CLINICAL HYGIENIC STUDY WITH A REVIEW OF THE LITERATURE AND SOME EXPERIMENTAL INVESTIGATION.—By Kaj Roholm. 1937. Published by Nyt Nordisk Forlag, Arnold Busck, Copenhagen (Graabrdretorv, 14). Pp. xi plus 364. Illustrated. Obtainable from H. K. Lewis and Company, Limited, London

THIS volume is a comprehensive review of the whole problem of fluorine in biology with special reference to its importance in industrial poisoning. The symptoms of fluorine poisoning in man and animals and its absorption, excretion and retention in the tissues are fully discussed. Several chapters are devoted to experimental work on rats, pigs, calves and dogs. The morbid anatomy, histology and biochemical changes in fluorine poisoning are well treated and should be of considerable interest both to the pathologist and clinician alike. The pathological changes found in the bones are a case in point. There are a number of first-class illustrations and a comprehensive review. So many organs are affected in this condition that indeed almost any medical man should be able to cull something of interest from its pages.

A TEXTBOOK OF NEURO-ANATOMY.—By Albert Kuntz, Ph.D., M.D. Second Edition. 1937. Baillière, Tindall and Cox, London. Pp. 519. Illustrated with 307 engravings. Price, 27s.

IN this second edition of the book, the first of which was published about six years ago, much of the text has been revised and some of its contents have been rewritten. The book has improved in many details of its text and diagrams, most of which are truly illustrative of the context.

In going through this book one is struck with some special quality which is not usually seen in the ordinary textbooks. The scheme of the book is scientific, comprehensive and is indeed well designed and of a high order. Endeavour has been made to work out the details of the complicated anatomy of the human central nervous system on the basis of the simpler fundamentals of the vertebral nervous system and to correlate those details with the basic structural plan—an endeavour wholly scientific.

Notwithstanding the expressed object of the author, to write a book to enable the beginner to grasp the difficult subject easily, we think the presentation has been carried beyond the easy understanding of the under-graduate medical students. The book however is comprehensive and the attempts of the author in dealing with the subject from the standpoint of comparative anatomy, phylogenetic and fundamental structural relationship will be appreciated more by that group of advanced students who are interested in further studies of the central nervous system and its disorders. Every part has been discussed with the microscopic and gross anatomy and also in relation to its functional significance. One will therefore find every aspect of the nervous system which is to be learnt for the investigation of its disorders.

A practical utility of the book will be seen at the end in so fas as it has given the practical methods to be applied in the study of the more important parts of the central nervous system. The value of the book has been further enhanced by the introduction of a series of clinical illustrations which will be very profitably read by those who are engaged in the special study of nervous disorders.

We have nothing but praise of the publisher's task which has been done creditably throughout.

M. N. D.

A BRIEF OUTLINE OF MODERN TREATMENT OF FRACTURES.—By H. W. Spiers, A.B., M.D. Second Edition. 1937. Baillière, Tindall and Cox, London. Pp. ix plus 137. Illustrated. Price, 9s.

THIS little book from the pen of the professor of orthopædic and fracture surgery, College of Medical Evangelists, Los Angeles, California, has deservedly entered its second edition and is likely to continue in demand. Fundamentals are not obscured and accepted practice is clearly stressed. The text is to the point and the illustrations are clear-cut line drawings. There are no useless *x*-ray reproductions. The senior student who has digested the contents of this short treatise will ensure for himself a sound foundation in this difficult branch of practical surgery. The publishers are to be congratulated on the paper used in this book. The absence of glaze is surprisingly easy on the eyes especially by artificial light.

H. R. R.

ANTENATAL AND POSTNATAL CARE.—By F. J. Browne, M.D. (Aberd.), D.Sc., F.R.C.S. (Edin.), F.C.O.G. Second Edition. 1937. J. and A. Churchill, Limited, London. Pp. xviii plus 588, with 79 illustrations. Price, 18s.

PROFESSOR BROWNE'S 'Antenatal and Postnatal Care' has already become a standard textbook on this subject. The second edition will be welcomed for the addition of much useful material which widens the scope and usefulness of the book.

There is a new chapter on constructive educational and social aspects of antenatal care by Professor Fairburn and another on the subject of radiology in obstetrics by Dr. R. W. A. Salmond. The section on diet in pregnancy has been enlarged and more prominence given to this important subject. The section on postnatal care now includes a description of puerperal exercises but the hygiene of the later puerperium and the care of the lactating woman still receive very little attention.

M. I. N.

MOTHERCRAFT: ANTENATAL AND POSTNATAL.—By Reginald C. Jewesbury, M.A., D.M. (Oxon.), F.R.C.P. (Lond.). Second Edition. 1937. J. and A. Churchill, Limited, London. Pp. ix plus 188, with 21 illustrations, 13 in colour. Price, 10s. 6d.

THIS excellent book is based on the principles of Sir Truby King's methods of infant feeding. The author states 'I have adhered to these principles because I consider they are founded on sound common sense, that they provide a scientific working guide, and, last but not least, that the results obtained from them are eminently satisfactory as judged from their practical application to a very large number of infants in this country (England). The remarkable work of Truby King in New Zealand is widely known but perhaps the most striking testimony of it is the marked fall in the infantile death rate in the Dominion since he devoted himself to infant welfare'.

While the principles of Sir Truby King's methods have been widely accepted the practical application of them has been necessarily limited to countries where special facilities and more extensive mothercraft teaching are readily available. The present edition has, by recommending whole milk and the introduction of solid food at an earlier age, indicated lines along which the

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methods advocated may be more easily adapted to use in a country like India. This book should be widely read in a country faced with the problem of an enormous infantile mortality.

M. I. N.

THE MEDICO-LEGAL POST-MORTEM IN INDIA.—By D. P. Lambert, M.D., Ch.B., D.T.M. & H. (Univ. Edin.). 1937. J. and A. Churchill, Limited, London. Pp. vi plus 113. Price, 5s.

IN this little book the author has set forth briefly but lucidly the full technique of a post-mortem examination undertaken for medico-legal purposes in India. He has further attempted to present the distilled essence of descriptions of appearance of deeds of violence and also of the normal seen in a mortuary. Results of characteristic modes of attack, such as a *lathi* blow, are very well described.

Almost every statement is definite. Of controversial matter and unnecessary details there is hardly a trace. Even disparaging remarks on textbooks are very few. Incidentally, the book will not replace textbooks.

The agreeably natural style makes the narrative flow like that of a detective story. 'All parts of the body are open to the murderer. The suicide can only reach a limited area.'

Certain items may be reconsidered in the next edition: under *hanging* the reasoning appears to be involved; under *abortion* and *lead poisoning* not much help will be given by the blue line on the gums, in acute cases; under *infanticide* precipitate labour causing fatal injuries and accidents to the infant may require to be proved or disproved. Perhaps blood from a corpse, dried on filter paper, may be advantageously preserved for a determination of blood group.

Of printer's errors only one attracts attention. On page 47 *hard* lens should be *hand* lens.

The size, the paper, the printing and the binding are good. A lower price would have been more in keeping with the economic conditions of India.

S. D. S. G.

ILLUSTRATIONS OF REGIONAL ANATOMY. SECOND EDITION.—By E. B. Jamieson, M.D. Sections I to VII. Section I: Central Nervous System (containing 48 plates). Section II: Head and Neck (containing 63 plates). Section III: Abdomen (containing 37 plates). Section IV: Pelvis (containing 33 plates). Section V: Thorax (containing 30 plates). Section VI: Upper Limb (containing 42 plates). Section VII: Lower Limb (containing 52 plates). E. and S. Livingstone, Edinburgh. Available from Messrs. Butterworth and Company (India), Limited (Publishers), Calcutta. Section I—Price, Rs. 4-12; Section II—Price, Rs. 8-8; Section III—Price, Rs. 3-12; Section IV—Price, Rs. 2-8; Section V—Price, Rs. 2-12. (The price of the complete set of seven sections—sections 6 and 7 having been published in 1936—is Rs. 31-8.)

IT is just a little over two and a half years ago that we reviewed the first edition of this publication (it appeared in October 1934) and we began with the following sentence: 'We do not feel that we are rating these books too high when we say that they are what anatomy students of a number of generations have been waiting for'. This opinion appears to have been justified for the enthusiastic reception of this valuable collection of drawings has led to the rapid exhaustion of the edition so that another one became necessary.

When it was first published this collection of plates was in five parts or sections dealing with the nervous system, the head and neck, the abdomen, the pelvis and the thorax respectively. There was an immediate demand that the collection should be made complete by preparing similar drawings of the limbs with the result that the author produced two more sections in June 1936, one of upper and the other of the lower limb.

The second edition appears to be only composed of the original five parts, presumably the other two parts appearing a good deal later, are not yet exhausted. We have, however, received all seven parts and as one would expect parts VI and VII are of exactly the same high standard as the other five.

There have been a few changes from the first edition and these are definite improvements. More plates are now coloured, this will lead to more easy identification of different structures and thus save a certain amount of time to the student and also improve the mental picture he will retain of any given diagram.

For the benefit of those who are not familiar with the first edition we will recapitulate some of the points that appeal to us as recommendations.

The loose leaf system allows of the rearrangement of the figures in any way that may be suitable for special circumstances, and it also permits of the separate use in the epidiascope or fixed on the blackboard for illustrating lectures. The actual method of filing is original and highly satisfactory as it is secure and is very easily operated.

This collection of plates will be found of great use to students and teachers of anatomy, especially in a country such as India where many of the smaller medical teaching institutions have not recourse to the cadaver or museum specimens for purposes of demonstration. When the excellence of their production is considered this 'picture gallery of anatomical studies' is issued at a very reasonable price, and a student not blessed with unlimited means would do well to deny himself something so as to obtain them.

A TEXTBOOK OF BOTANY FOR MEDICAL, PHARMACEUTICAL AND OTHER STUDENTS.—By Prof. James Small, D.Sc. (Lond.), Ph.C., F.L.S., M.R.I.A., F.R.S.E. Fourth Edition. 1937. J. and A. Churchill, Limited, London. Pp. x plus 717 with over 1,350 illustrations. Price, 21s.

ACCORDING to the author, the book is designed to replace late Professor Reynold Green's *Manual of Botany* which, though a valuable textbook on the subject, was to some extent out of date. The author has not followed the customary arrangement into morphological and physiological subdivisions. He has discussed physiological processes and anatomical and morphological features at the point where they become dominant in the life of the plant. There is a difference of opinion on this point as to whether it is an advantage to beginners. The special feature of the book is the incorporation of diagnostic characters of certain medicinal plants in appendix I, which will be very useful to medical and pharmaceutical students. The appendices II and III will serve as a guide to students in their practical work. In the appendix IV, the author has nicely collected together the life-sketches of lower plants.

The book has been copiously illustrated; its language and style are simple and elegant. In the present edition the author has dealt with recent advances in plant physiology, *e.g.*, hormone (auxine), enzyme chemistry, statoliths theory, etc., in a masterly way. But so far as mitosis is concerned, the statements on pages 33 and 34 are not in line with the recent advances in the branch of cytology (Sharp, Darlington).

The book would have been much more valuable to the Indian students had there been examples from Indian flora in the morphological portion.

S. M.

THE ELEMENTS OF MEDICAL TREATMENT.—By R. Hutchison, M.D., LL.D. (Hon.), D.Sc. (Oxon.), F.R.C.P. Third Edition. 1937. John Wright and Sons, Limited, Bristol. Pp. 194. Price, 5s.

THE reviewing of the third edition of this book, which even in its short life has become a classic, gives an excellent opportunity for cynical ruminations on modern medical progress. We will content ourselves with the observation that this book demonstrates how very little the *elements* of medical treatment do change

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in a period of five years. People become constipated, have diarrhœa, or bleed, hearts fail, and worms inhabit our intestinal tracts, and we treat them in much the same way as we did five and even ten years ago—perhaps in the last-named instance there are more effective methods of getting rid of them than the author suggests—though if people don't sleep there are perhaps more ways of making them do so nowadays.

This is a book that every medical student should be made to read and digest before he is allowed to qualify, and every practising doctor at intervals of not less than five years, as an antidote to the flood of proprietary medical literature with which he is daily inundated. At twice its price, the book would be a bargain.

L. E. N.

Abstracts from Reports

HEALTH ORGANIZATION OF THE LEAGUE OF NATIONS. ANNUAL REPORT ON THE RESULTS OF RADIOTHERAPY IN CANCER OF THE UTERUS. FIRST VOLUME. EDITED BY J. HEYMAN, STOCKHOLM

THE present volume is the first of a series of annual reports on the results of radiotherapy in cancer of the uterus, which the health committee of the League of Nations has decided to issue. The principal object of the reports is to provide a convenient work of reference for those who wish to know, statistically, the results obtained in radiotherapy of the cervix uteri when agreed rules for the compilation of the statistics have been observed.

The preparations for issuing the annual reports have been entrusted to an advisory committee consisting of Dr. J. Heyman, Radiumhemmet, Stockholm (Editor); Dr. A. Lacassagne, Radium Institute of the University, Paris; Lieut.-Col. A. B. Smallman, Ministry of Health, London.

The advisory committee, which is empowered to invite the collaboration of institutes and clinicians throughout the world, recognizes that its first annual report must necessarily be of an experimental character and serve as a guide for future work. It has consequently restricted the statements included in the report to those clinics and countries which were associated with the earlier work of the health committee.

The first report is concerned only with cancer of the cervix; the question of widening the scope of future reports so as to include, for example, analysis of material relating to the corpus uteri and the vagina is under consideration.

In a separate chapter the sources of error in the statistical assessment of the result of treatment are discussed. The chief of these are due to (1) the smallness of the samples for analysis, and (2) the lack of comparability between the clinical material analysed at the co-operating clinics.

In order to meet the difficulty caused by the smallness of the samples, the following procedure has been adopted: For samples containing fewer than 15 cases, percentages are not calculated; for samples containing from 15 to 100 cases, percentages are printed in ordinary type, and for samples relating to 100 or more cases, in black type.

Attention is drawn to the fact that comparability is difficult to secure because of the dissimilar composition of the material at different clinics. Some clinics receive for treatment unselected material; in the case of others a varying degree of voluntary or non-voluntary selection takes place.

It is pointed out that these two sources of error must be reduced to a minimum before it is possible to assert that differences between the results at different clinics are due to differences in the methods of treatment employed.

In comparing the figures given in this first report, the above sources of error should be kept in mind.

The committee has adopted certain rules which collaborators are expected to observe regarding cases which should be included in or excluded from the statements.

Further, two series of tables and relevant notes have been submitted, aiming at a uniform presentation of the material reported and at a uniform method of calculating the result of treatment. The first series is intended for the annual statements relating to cases treated in 1930, the second for indicating the results obtained at an earlier period.

The collaborators' statements of the results of radiotherapy in cancer of the cervix in 1930 and previous years constitute the main part of the first annual report.

Statements have been submitted by:

1. The 'Centre des tumeurs de l'Université de Bruxelles', Belgium (contributed by Professor J. Murdoch).
2. The Liverpool Radium Institute, England (contributed by Dr. P. Malpas).
3. The Marie Curie Hospital, London, England (contributed by Dr. Elizabeth Hurdon).
4. The Radium Centre for Carcinoma of the Uterus, London County Council, England (contributed by Sir Comyns Berkeley).
5. The 'Institut du Radium de l'Université de Paris', France (contributed by Dr. A. Lacassagne).
6. The 'Radiumhemmet', Stockholm, Sweden (contributed by Dr. J. Heyman).

The committee takes the opportunity of inviting directors of clinics and others interested in this subject to communicate with the editor (Dr. J. Heyman, Radiumhemmet, Stockholm) with a view to their participation in the future.

The report has been printed in English and French, the official languages of the League of Nations.

ANNUAL REPORT OF THE INSTITUTE FOR MEDICAL RESEARCH, FEDERATED MALAY STATES, FOR THE YEAR 1936. BY R. LEWTHWAITE, ACTING DIRECTOR

RESEARCH has been undertaken in many directions, old and new. Established investigations have progressed further towards their culmination; investigations newly begun embrace such problems as filariasis, the menace of the rat, nutrition, and certain aspects of the anti-larval action of oils.

Routine work has increased considerably; and, partly as a counter-measure, the personnel of the division of chemistry is to be increased by the addition of one chemist, now being recruited in Britain. With increasing knowledge in the field of medicine and its many related sciences, more and more is asked of this institute as to the quantity, refinement and variety of its routine work. Such requests cannot be refused, by reason of their importance to the public. Yet they encroach gradually on research work, by which the merits of the activities of this institute must primarily be measured, and which therefore can only be maintained by addition to the qualified personnel, such as has here been readily granted.

In the division of bacteriology there has been much re-organization consequent on an increase in the material submitted for routine examination. The introduction of the small screw-topped bottle for culture media has proved most useful both in effecting economy of labour and space, and in securing more successful cultural results.

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Progress reports on investigations of various diseases are given, and interesting findings in routine observations are discussed. Laboratory findings in cases of agranulocytosis and glandular fever, diseases of rare occurrence in Malaya, are given, together with brief notes from the literature.

The outstanding feature of the work of the division of chemistry has again been the remarkable diversity of the problems with which it has been confronted. It will be seen from the chief chemist's report that assistance has been given to nine Government departments, in addition to the co-operation given to other divisions of this institute. Much of this type of work is far from being pure routine; a glance only at the variety of examinations made for the police department suffices to indicate the inter-play of intellect, imagination and intuition essential for the solution of the problems entailed thereby.

An investigation of practical economic application was that concerning the carotene content of four grades of Malayan palm oil.

The entomologist has continued his collaboration with the malaria research officer in the latter's field experiments in clinical prophylaxis. During these investigations a suggestion made by Professor Gater that two, possibly three, different species of mosquitoes have hitherto been identified as *A. umbrosus* was investigated by the entomologist in collaboration with Professor Gater. The findings indicated that the suggestion was well founded; and reference is made to the problems arising therefrom.

In order to extend our knowledge of the biology of anophelines in relation to the transmission of malaria to Kampong areas, three investigations are in progress; and the results already available are discussed at some length.

An investigation, begun last year, to test the efficiency of a new anti-malarial oil has continued. Early results indicate that an improved mixture has been obtained; but further results are awaited before conclusions are drawn.

The entomologist has begun an investigation into the problem of filariasis in Malaya; collaborating with him is Dr. J. J. C. Buckley, of the Department of Helminthology at the London School of Tropical Medicine. The investigation is at present concentrated on one area on the Bernam river (the boundary between Selangor and Perak) where a village and an estate have for some time been known to be endemic centres of elephantiasis. Recently an extensive area of adjacent jungle has been felled, drained, and planted with paddy by an immigrant labour force; and it is important to know what is the probability of the disease spreading to this force. The disease is endemic in certain parts of Malaya, in coastal and riverine areas. In other parts of the world, India, Africa, and the West Indies, the disease has proved a scourge that has seriously affected labour. For the development of rice growing, such as is occurring in certain of the above areas, the disease may become an important factor in success or failure. At present the prevention and treatment of filariasis leave much to be desired, but there is the prospect that with investigation and experimental work valuable results may be achieved. In the report of the entomologist will be found the early results of four lines of investigation.

The malaria research officer has continued investigations in clinical prophylaxis begun at the instance of the League of Nations' Malaria Commission, being part of a comprehensive trial of prophylactic treatment under different economic, climatic and racial conditions. The efficacy of atebrin as a prophylactic has been amply demonstrated in large-scale field experiments. That the drug may cause occasional severe reactions is well known, and experiments are still in progress to determine the optimum prophylactic dose. Collateral extensive experiments with prophylactic quinine are being carried out to afford a direct comparison of both the efficacy and cost of the two methods. An interim report is given. Other malarial remedies tested were atebrin-musonate, malarene, and a tablet of quinine specially compounded to reduce cost without loss of efficacy. The summarized results are submitted.

Brief reference is made to the inception of a malarial survey of the Selangor coast area.

The research work of the division of pathology has been directed primarily to the problem of the preparation of a prophylactic vaccine for the tsutsugamushi disease. The source of virus used was infected material from animals experimentally infected; various methods of attenuation have been tried, and the more successful are being followed up. The investigation of an alternative and perhaps more hopeful source of virus, the tissue of infected mites, is projected; but must necessarily be protracted and laborious in view of the breeding problems entailed.

Five years of investigation has culminated in the establishment of the identity of the two diseases, rural typhus and tsutsugamushi. The typhus-like diseases of Malaya are thus reduced from three to two in number—a simplification to be welcomed in the study of the group of typhus fevers, ever enlarging throughout the five continents.

Further studies in the epidemiology of these fevers have been undertaken. The transmission of tsutsugamushi by the tick and the flea, and of urban typhus by the tick, has proved to be of doubtful occurrence, certainly of no importance. The transmission of tsutsugamushi by cannibalism amongst rats has proved possible, but the inferences are that it is of little importance epidemiologically.

An interesting finding has been that an infection of guinea-pigs with the *Spirillum minus*, in the absence of signs of typhus infection, could give a high agglutination of the OXK strain of *Proteus;* further investigation will be made as opportunity permits.

The report of the division of serology indicates the comprehensive range of examinations required of this division. In addition to a large volume of routine work certain investigations have been made. A drug 'T.A.D.D.', claimed to have amœbicidal value, was tested. A concentration method, recommended by certain British and Indian laboratories, has proved a very successful modification of the Friedmann-Zondek-Aschheim test for pregnancy.

Investigations concerning the blood-grouping of stains variously contaminated, continued from last year, have yielded results valuable in establishing criteria by which the results of these important medico-legal examinations should be interpreted.

The large volume of routine examinations reported from the Ipoh Branch Laboratory indicates how successfully this laboratory serves the dual purpose of relieving the parent laboratory at Kuala Lumpur of hampering routine and obviating delay in laboratory diagnosis for the hospitals of Perak. The officer in charge of the Branch Laboratory from May to December carried out tuberculin reactions on people of different race and age groups; and his results to date are given in summary.

The activities of the lymph station proceeded uneventfully throughout the year.

A brief reference is made to the inception of an investigation of rat viruses.

[This abstract from the director's general review will indicate the numerous lines of research that are being undertaken. It is unfortunately not possible to abstract these in detail, but specialists in the various branches are referred to the reports of the divisions from which they will obtain valuable information.]

ANNUAL REPORT OF THE SANITARY BOARD, BENGAL, FOR THE YEAR 1936. PUBLIC HEALTH DEPARTMENT, GOVERNMENT OF BENGAL

It is a satisfactory feature of the year under review that although financial stringency prevented Government from making the usual grants from provincial revenues towards the cost of municipal sanitary projects, the municipal boards, as a whole, were able to devote greater attention to the problems of water-supply, sewerage and drainage in urban towns, and continued to finance such projects by means of loans

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and local contributions. As a result, there was a considerable expansion of the work of the engineering branch of the public health department during the year and a great deal of progress was made in investigations into and preparation of new water-supply, drainage, sewerage and other sanitary schemes.

The department continued to render valuable assistance to the municipalities and other local authorities in the shape of inspection and advice as well as of supervision, where found necessary or when called upon to do so. In particular, the department was called upon to examine and approve schemes of water-supply based on tube-wells proposed to be financed by district boards out of loan funds, as Government were satisfied that owing to faulty methods of construction and want of attention to the details of maintenance, there had been, in the past, a considerable waste of public money when such schemes had been undertaken and financed out of district funds or grants and loans from Government.

Government desire to invite particular attention to paragraph 18* of the report of the Chief Engineer, Public Health Department, and trust that municipalities intending to undertake water-supply projects for their towns will readily agree to have their schemes designed on the decentralized storage system of distribution recommended by the chief engineer, in view of the relative advantages of this system—

(*a*) as providing a better method of checking waste of water in public water-supplies, and

(*b*) as ensuring protection against the risk of contamination of such supplies.

The sanitary board, the membership of which increased from 15 to 16, held seven meetings during the year under review and examined various projects of sanitary engineering before their submission to Government. The board also considered the reports of inspection made by the departmental officers and reviewed periodical reports on the analysis of samples of water from various sources in the province and suggested remedial measures, where necessary. They also advised Government in regard to the control of malaria—particularly in undertaking anti-*ludlowii* survey and control measures in the vicinity of Calcutta.

During the year, the board formed a sub-committee to investigate the possibilities of extending the system of water-supply by tube-wells for irrigation purposes.

**Decentralized storage system.*—All new schemes of water-supply are being carried out on the decentralized storage system of distribution. Three town supplies are already operating on the system, and two more will come into action very shortly. It is now clearly demonstrated that the great difficulty in tropical water-supplies, *viz,* waste of water through taps left running, can be overcome by this method. It is also now clear that in several ways a water-supply is better protected from pollution by this system. A fertile source of pollution of water in the old type of distribution system is the leaky joint at the bottom of a standpost which has worked loose, dirty water being sometimes drawn in during the period of no pressure in the mains. The street tanks of the decentralized storage system cannot work loose, and the discharge point from the mains is 7 feet above ground *inside* the tank at the top. No dirty water, nor even dust, therefore, can possibly be drawn in. The application of the system to *existing* water-supplies is the problem which is now being faced. A code of rules for transformation of house connection from the old system to the new has been approved by Government and one municipality passed a resolution adopting it. But very little progress beyond that has so far been made. The chief difficulty in the way is the failure on the part of municipal commissioners to realize that some form of control of waste *must* be applied in order to have efficient distribution of water. Some seem to prefer to muddle along on the old system whereby the favoured few get as much water as they want while the bulk of the people get little or none. (Paragraph 18 of the Report of the Chief Engineer, Public Health Department, Bengal, for 1936.)

Correspondence

DEVELOPMENT OF HEALTH EDUCATION WORK IN UNITED PROVINCES

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I write for the information of readers who may be interested in the article entitled 'Development of Health Education Work in United Provinces', which was published in the *Indian Medical Gazette* of October 1937, that the averages of weight and height for various ages in United Provinces which are given in a schedule in the article are based on the records of over 10,000 school boys.

Yours, etc.,
A. HAMID,
Assistant Director of Public Health.

HYGIENE PUBLICITY BUREAU,
LUCKNOW,
6th December, 1937.

Service Notes

APPOINTMENTS AND TRANSFERS

COLONEL N. M. WILSON, O.B.E., to act as Surgeon-General with the Government of Madras, with effect from the afternoon of the 15th September, 1937.

The Governor is pleased to appoint Colonel P. S. Mills, Inspector-General of Civil Hospitals, Bihar, as Surgeon-General with the Government of Bengal, *vice* Major-General D. P. Goil, K.H.P.

Lieutenant-Colonel C. M. Plumptre, Acting Superintendent, Government Hospital for Women and Children, Madras, and Professor of Midwifery, Medical College, Madras, to be Principal, Medical College, Madras, with effect from the date of taking charge, *vice* Lieutenant-Colonel C. Newcomb, retired.

On return from leave Lieutenant-Colonel M. L. Puri resumed charge of his duties as Civil Surgeon, Rawalpindi, with effect from the 1st October, 1937.

On return from leave Lieutenant-Colonel P. A. Dargan resumed charge of his duties as Civil Surgeon, Amritsar, with effect from the 4th October, 1937.

On return from leave Lieutenant-Colonel C. J. Lodge Patch, M.C., resumed charge of his duties as Medical Superintendent, Punjab Mental Hospital, Lahore, with effect from the 15th October, 1937.

Lieutenant-Colonel D. Clyde has returned from leave *ex*-India, and has been posted as the Civil Surgeon of Lucknow, from 11th October, 1937.

Lieutenant-Colonel S. L. Bhatia, M.C., is appointed as Principal, Grant Medical College, and Superintendent, J. J. Group of Hospitals, Bombay, with effect from the 27th October, 1937.

On transfer from Multan Lieutenant-Colonel A. S. Fry assumed charge of the Office of Civil Surgeon, Simla East, on the forenoon of the 28th October, 1937, *vice* Lieutenant-Colonel B. Gale proceeded on leave.

Lieutenant-Colonel B. F. Eminson resumed charge of the Office of Civil Surgeon, Hyderabad, Sind, with attached duties, with effect from the 30th October, 1937.

Lieutenant-Colonel R. A. Logan, Civil Surgeon, Amraoti, is reverted to military employment from 11th November, 1937, and posted to the Indian Military Hospitals, Lahore, as Second in Command.

Lieutenant-Colonel J. E. Ainsley returned from leave and assumed charge of the Office of Civil Surgeon, Amraoti, from 11th November, 1937.

Major A. I. Cox to rejoin, on return from leave, the appointment of District Medical Officer, Coimbatore, and Superintendent, Government Headquarters Hospital, Coimbatore.

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Major B. N. Hazra made over charge of the Barisal Jail to Dr. M. Gupta in the afternoon of the 6th September, 1937, the latter again made over charge of the jail to the former in the forenoon of the 28th September, 1937.

On return from leave Major J. J. Beausang resumed charge of his duties as Civil Surgeon, Sargodha, with effect from 7th October, 1937, *vice* Captain P. C. Dutta, who became supernumerary to the number of officers provided with appointments.

Major K. S. Fitch made over charge of the Hooghly Jail to Dr. J. M. Mukherji, on the forenoon of the 10th November, 1937.

Major S. Annaswami made over charge of the Alipore Central Jail to Lieutenant-Colonel M. Das, M.C., on the forenoon of the 19th November, 1937.

Captain F. W. Allinson, Civil Surgeon, Midnapore, has been appointed temporarily to act, in addition to his own duties, as Superintendent of the Midnapore Central Jail, with effect from the forenoon of the 30th September, 1937, until further orders.

On return from leave Captain B. Temple-Raston resumed charge of his duties as Civil Surgeon, Jhelum, with effect from the 12th October, 1937.

Captain A. M. Sheridan has been transferred from Lucknow to Jhansi, where he took over charge on the 16th October, 1937.

Captain C. B. Miller, Resident Medical Officer, J. J. Hospital, Bombay, is appointed to officiate as Surgeon to His Excellency the Governor of Bombay, with effect from the 30th October, 1937, pending further orders.

Captain F. W. Allinson made over charge of the Midnapore Central Jail to Major S. Annaswami on the forenoon of the 26th November, 1937.

Captain A. M. Sheridan has been transferred from Jhansi to Cawnpore, *vice* Major W. Aitchison, proceeding on leave from 4th December, 1937.

LEAVE

The Governor is pleased to grant leave on average pay for 6 days to Major-General D. P. Goil, K.H.P., Surgeon-General with the Government of Bengal, preparatory to retirement, with effect from the 10th November, 1937, and in continuation leave on average pay for 4 months and 25 days from the 16th November, 1937.

Lieutenant-Colonel E. C. A. Smith, Superintendent, Central Mental Hospital, Yeravda, is granted leave on average pay for 7 months and 28 days, with effect from the 1st October, 1937.

Lieutenant-Colonel B. Gale, Civil Surgeon, Simla East, is granted combined leave for 5 months and 7 days, with effect from the 27th October, 1937 (afternoon).

PROMOTIONS

Majors to be Lieutenant-Colonels

A. V. Lopes. Dated 2nd November, 1937.
J. H. Barrett. Dated 2nd November, 1937.
I. S. Nalwa. Dated 16th November, 1937.

Captain to be Major

B. D. Khurana. Dated 28th October, 1937.

RETIREMENTS

Colonel C. H. Reinhold, M.C. Dated 16th November, 1937.

Lieutenant-Colonel C. Newcomb, C.I.E. Dated 3rd October, 1937.

Notes

'WELLCOME' BRAND SULPHONAMIDE-P

FOLLOWING the introduction of 'Tabloid' Sulphonamide-P (p-aminobenzenesulphonamide or sulphanilamide), for the oral treatment of streptococcal and other infections, Messrs. Burroughs Wellcome and Company now issue the medicament in a fine crystalline powder as 'Wellcome' brand Sulphonamide-P, in bottles of 25 and 100 grammes. The 'Wellcome' brand product is intended for both parenteral and oral administration.

Recent investigations have considerably broadened the therapeutic indications for Sulphonamide-P. In addition to its established value in hæmolytic streptococcal infections (puerperal septicæmia, erysipelas, scarlet fever with complications, tonsillitis, etc.), there is now justification for its trial in cases of meningococcal meningitis, and *Bacillus coli*, *B. ærogenes* and *B. proteus* infections of the genito-urinary tract. Laboratory experiments also indicate that the drug may be of use in typhoid and paratyphoid fevers, and in staphylococcal septicæmia or infections; clinical experience in this group of infections is at present small.

'CELLOPHANE'

WE have received a letter from the British Cellophane Company pointing out that in our issue of September last year we printed the word *cellophane* a number of times. This company points out that in this paper 'Electrodialysis in the Purification of Concentrated Serum Antitoxin' by Nirmala Pada Chatterjee, the word *Cellophane* is used in a generic sense to denote transparent cellulose sheeting generally.

'We wish to point out, however', they add, 'that the word *Cellophane* is not a generic term, but that it is the registered trade mark, also in British India, of British Cellophane Limited, and denotes the brand of transparent cellulose sheets and films manufactured and supplied by this company.

Its use in the manner employed in the article in question is thus both erroneous and misleading.

We are naturally pleased to see references to our *Cellophane* cellulose film in the press; but our tacit acquiescence in misuse of our registered trade mark might eventually endanger our rights thereunder'.

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Original Articles

GASTRIC ACIDITY IN HEALTH AND DISEASE IN INDIA

By L. EVERARD NAPIER, M.R.C.P. (Lond.)
R. N. CHAUDHURI, M.B. (Cal.)
and
M. N. RAI CHAUDHURI, M.B. (Cal.)
Department of Tropical Medicine, School of Tropical Medicine, Calcutta

THE literature dealing with the findings of gastric analysis is voluminous, but satisfactory standards of normal gastric acidity among Indians have so far been lacking.

Until recently, it has been stated from time to time that the acid secretion in Indians living in India is lower than that in Europeans, living either in hot climates or in temperate zones.

Previous work

Some twenty years ago, McCay in Calcutta did some work on this and reported that the gastric acidity was low in rice-eating Indians.

Dr. S. Bhattacharyya (1933) did a number of analyses on normal Indians and reported the acidity as low.

Dharmendra and Napier (1935) and Napier and Dharmendra (1936) found that in asthma, mostly among Indians, the general level of acidity was higher than the normal of the textbooks whereas other workers in Europe had found the acidity lower in asthmatics (figure 1). They believed that there was no constant change and that the level was much the same as in normal Indians.

Napier and Das Gupta (1935) found that in normal Indians in Calcutta (figure 2) the mean acidity level was distinctly higher than that shown in the textbooks, and that that of so-called 'normal' tea garden coolies (figure 3) though not so high was nevertheless higher than the normal European standard.

Apperly (1936) claimed that in Australia he had found that the gastric acidity varied according to the distance from the equator, and that it was also less in the summer than in winter. He further suggested that it was always low in anæmia. This is entirely contrary to our, and other workers', experience.

Rao (1937) carried out 100 gastric analyses on normal Indian males in Southern India and found a high level of acidity (figure 4).

The present investigation

In order to get further evidence, we have tabulated the results of all the gastric analyses that had been done in the Tropical Diseases Hospital during the last 18 months; these were all done in the department of tropical medicine by one of us.

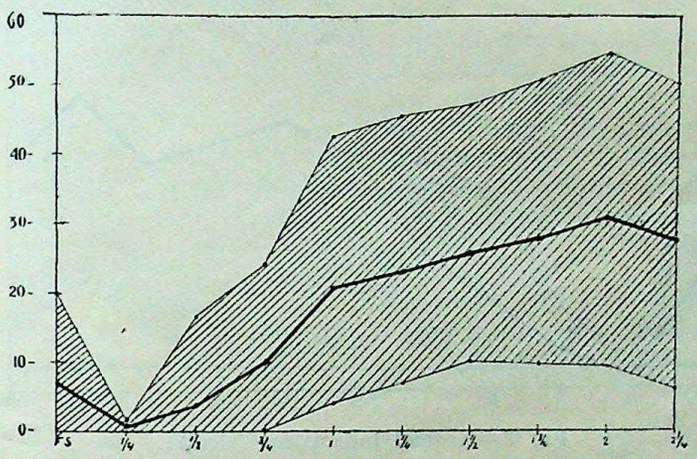

Fig. 1.—Mean readings and standard deviations in 38 cases of asthma.

These cases cannot, however, be regarded as normal individuals; some of these patients were suffering from anæmia, others from gastro-intestinal disturbances, and yet others were persons undergoing a routine examination for symptoms unconnected with the gastro-intestinal tract.

The technique

The alcohol test meal was used in this series of cases. Our reason for preferring this to the oatmeal gruel was the various disadvantages frequently encountered in the latter method. For instance, many patients found it very difficult to swallow a pint of tasteless gruel with a tube in the mouth. A good deal of time and trouble is expended in preparing a meal, and sometimes it was difficult to draw the fluid, which was thick, through the tube. Further a pint of it is sufficient to dilute the gastric juice very appreciably and to lower the readings, at least during the first hour. With the alcohol meal most of the disadvantages of the gruel are overcome. The 'meal' can be kept in stock ready for immediate use; it is passed directly into the stomach through the tube; the patient does not have to taste and swallow it; there is

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little dilution of the gastric juice; the fluid obtained is a clear one; and alcohol being an efficient gastric stimulant promotes the secretion satisfactorily.

The argument that it is not a natural stimulant has been used, but this would apply to most of the gruel meals devised. Even if it is not enjoyed by the average patient, the alcohol is at least not repulsive to him and there is no psychological inhibition.

One hundred c.cm. of a 7 per cent alcohol solution in distilled water are used as the 'meal'. After the fasting contents have been withdrawn, the meal is injected and subsequently samples of the contents, about 10 c.cm., are obtained every fifteen minutes up to a maximum of 10 specimens. The biochemical investigations are carried out in the usual manner, by titrating a measured volume of each specimen in turn against a decinormal caustic soda solution, using Topfer's reagent as the indicator. The resulting figures are plotted on charts drawn in the form suggested by Bennett and Ryle. We shall only consider the free acid here.

The clinical material

Gastric analysis by this method was performed in a series of 209 cases, and the results have been classified under the following headings :—

I	Hyperchlorhydria	Over 65 c.cm. of N/10 NaOH per 100 c.cm.
II	Normal range	High—over 45 but under 66. Average—25 to 45. Low—under 25 but not below 10.
III	Hypochlorhydria	Below 10 units.
IV	Achlorhydria	Tested with histamine— Without acid response (*a*). With acid response (*c*). Not tested with histamine (*b*).

The above has been the grouping more or less arbitrarily adopted by the senior writer for some time, as a result of his experience

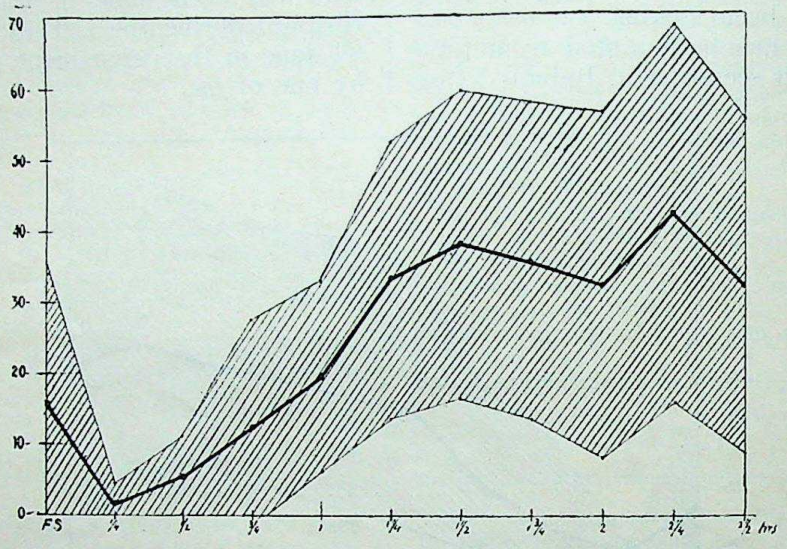

Fig. 2.—Normal Indians in Calcutta.

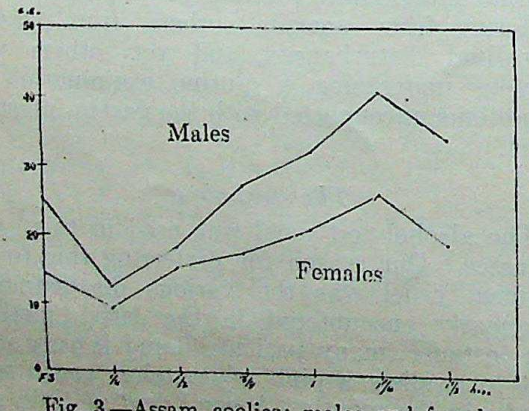

Fig. 3.—Assam coolies: males and females.

India. It is interesting to compare it with the of Bell (1922) to whose paper his attention has only recently been drawn. The two groupings are contrasted in the following table (I).

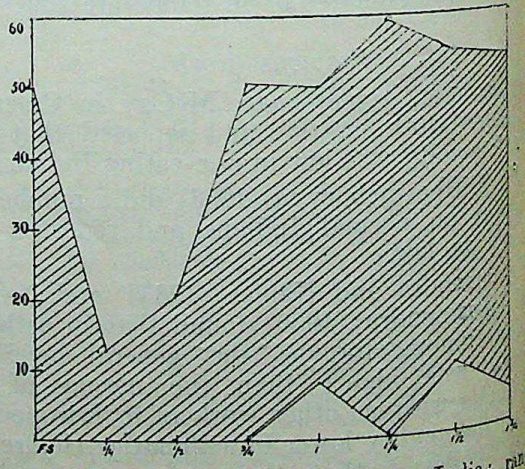

Fig. 4.—Normal Indians in Southern India; range

Our figures are slightly but distinctly higher than Bell's; for example, we look upon a maximum acidity of below 25 c.cm. as low, whereas Bell requires it to be below 20 c.cm.; we place the mean normal zone between 25 and 45, whereas Bell considers any figure above 30 high; and his criterion for hyperacidity, 60 c.cm. against our 65 c.cm.

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TABLE I

Groups	Type	Authors'	Bell's
I	Hyperchlorhydria	Over 65 c.cm.	Over 60 c.cm.
IIa	High normal ..	Over 45 c.cm.	Over 30 c.cm.
IIb	Normal ..	25 to 45 c.cm.	Under 30 c.cm.
IIc	Low normal ..	Under 25 c.cm.	Under 20 c.cm.
III	Hypochlorhydria	Under 10 c.cm.	Under 10 c.cm.
IV	Achlorhydria ..	No free HCl.	No free HCl.

In the series were included Indians, Europeans and others, both males and females; this fact has been utilized to compare gastric findings in different racial groups. The patients have been divided into the following racial groups :—

(1) Europeans,
(2) Indians from Bengal and Bihar,
(3) Indians from other provinces, and
(4) other classes including Anglo-Indians and Jews.

They have been further subdivided and considered according to their sex and age.

Table II shows the results of gastric analysis in different groups according to the sex. A better idea of the 'acid state' in the various racial groups can be obtained from table III showing the percentage incidence of the different acid states; in this table (III) for the sake of simplicity and to avoid the sex factor we have included only the male cases. It shows that the percentage of hyperchlorhydria was largest among the Europeans and other males, the non-Indian groups, and that Bengal Indians came very close to them. The acidity was within the normal limits in the majority of the Bengalis, in spite of the fact that many of them were suffering from conditions which usually give rise to hypo-acidity. The percentage of hypochlorhydria also was highest among the Europeans, but there was no case of complete achlorhydria amongst them, so that the deficient-acid group, combined hypo- and achlorhydria, was only slightly greater amongst Europeans than amongst Bengalis and less than in the other Indian series. Indians from other provinces show a much lower acidity all round, and by far the highest incidence of achlorhydria.

TABLE II

Showing the distribution of cases in the various acid groups, according to their race and sex

	Sex	Number of cases	Hyperchlorhydria 65 +	Normal range			Hypochlorhydria 10 —	Achlorhydria		
				High 45 +	Medium 25–45	Low 10–25		Even after histamine	Not tested c̄ histamine	c̄ acid response after histamine
Europeans ..	Male	20	5	3	7	1	4	..	..	..
Do. ..	Female	31	1	5	8	5	6	..	5	1
Indians (Bengali and Behari).	Male	89	16	20	21	16	7	2	6	1
Do. ..	Female	16	1	1	5	3	3	2	1	..
Indians (other provinces).	Male	28	1	4	6	9	2	2	2	2
Do. ..	Female	6	1	1	2	1	..	..	..	1
Other non-Indians	Male	10	2	2	4	1	1	..	..	..
Do. ..	Female	9	1	2	2	2	1	..	..	1

TABLE III

Showing the figures for males in table II on a percentage basis

	Hyperchlorhydria 65 +	Normal range			Hypochlorhydria 10 —	Achlorhydria		
		High 45 +	Medium 25–45	Low 10–25		Even after histamine	Not tested c̄ histamine	c̄ acid response after histamine
Europeans ..	25	15	35	5	20	..	..	..
Bengal Indians	17.5	22.4	23.5	17.5	8.4	2.4	7.2	1.1
Other Indians	3.5	14.2	21.5	32.4	7.1	7.1	7.1	7.1
Others ..	20	20	40	10	10	..	..	..

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Table IV and figures 5, 6 and 7 show the means and standard deviations in male hospital patients, Europeans, Bengal Indians, and other Indians, respectively.

TABLE IV

Shows the mean and standard deviation of the gastric acidities at various intervals for both groups of Indian and European males, separately

		F. S.	¼ hr.	½ hr.	¾ hr.	1 hr.	1¼ hrs.	1½ hrs.	1¾ hrs.	2 hrs.
Bengali males	Mean ..	14.6	12.9	24.6	29.8	26.4	25.5	23.2	20.5	20.0
	Standard deviation	± 19.9	14.7	23.1	25.8	23.8	24.9	25.5	23.8	24.6
Other Indians	Mean ..	9.3	6.9	14.9	17.9	17.8	15.2	12.3	10.5	11.4
	Standard deviation	± 19.5	10.7	14.7	18.2	19.8	16.4	14.6	14.3	17.7
European males	Mean ..	12.6	24.2	31.1	31.8	30.7	27.9	23.8	22.6	14.8
	Standard deviation	± 16.9	32.6	30.4	27.2	29.0	30.2	24.5	26.2	20.5

Achlorhydria

Altogether in 26 cases there was complete absence of free hydrochloric acid after the alcohol meal: males—15 and females—11.

Histamine 0.25 to 0.5 mgm. was given hypodermically at a second test meal after the second post-prandial sample had been taken, in 12 cases; in six of these there was some secretion of free acid in the samples taken after the histamine administration, but in the other six there was none. Fourteen cases were not tested with histamine.

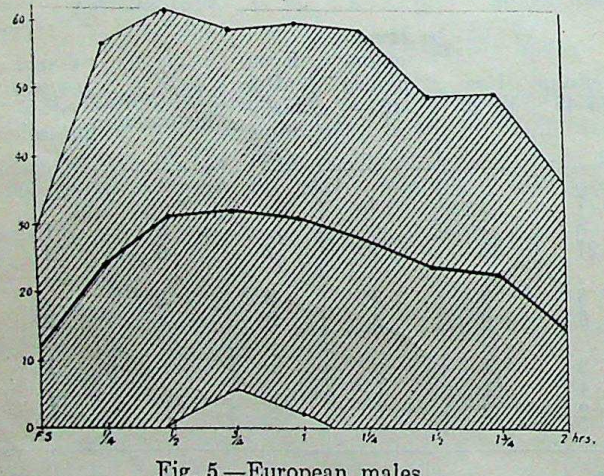

Fig. 5.—European males.

According to the table given by Harrison (1937), achlorhydria occurs in 4 per cent of normal persons; other workers have placed the percentage higher. If, in our series, the response to histamine in the 14 untested cases be considered to be 50 per cent, as in the 12 tested cases, then the total incidence of achlorhydria is 13 out of 209 cases, which is less than 6 per cent. Achlorhydria is a complication in many pathological conditions; in the anæmic cases it was over 22 per cent (*v.i.*). If these are excluded, the incidence of complete achlorhydria would, by the same process of deduction, be about 4 per cent. It seems to indicate that it is not more common in India than in Europe and America.

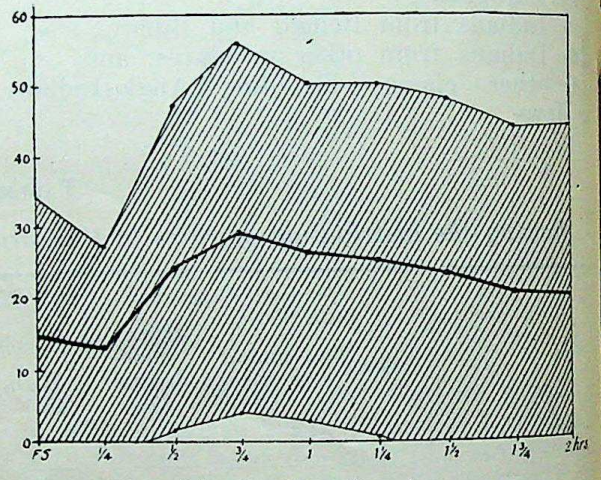

Fig. 6.—Bengali males.

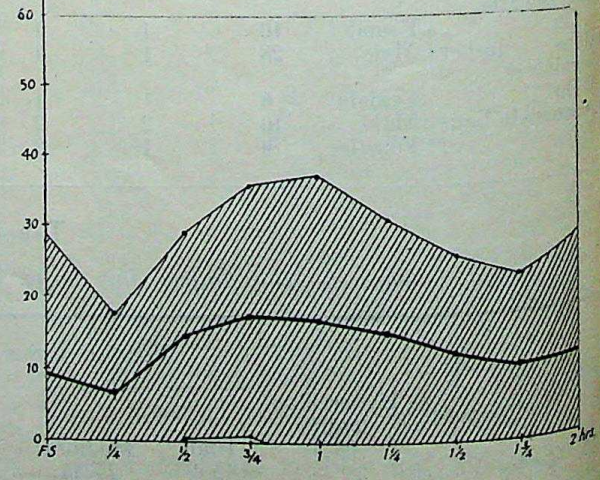

Fig. 7.—Other Indian males.

Sex

Table V shows the distribution, amongst the four main acid groups, of males and females separately.

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TABLE V

	MALES		FEMALES	
	Number	Per cent	Number	Per cent
Hyperchlorhydria	24	16.4	4	6.5
Normal range ..	94	63.9	37	59.7
Hypochlorhydria	14	9.5	10	16.1
Achlorhydria ..	15	10.2	11	17.7

This table shows that the incidence of hyperchlorhydria was three times as common amongst males as females and conversely that hypo- and achlorhydria were nearly twice as common amongst females as amongst males.

Age

Table VI shows the distribution of males according to their 'acid state' and age. The influence of age is shown better if the cases are arranged into the four main acid groups and the percentage incidence calculated as in table VI(*a*).

increases. Conversely, if the low-acidity groups are taken together, the incidence in these groups decreases with age.

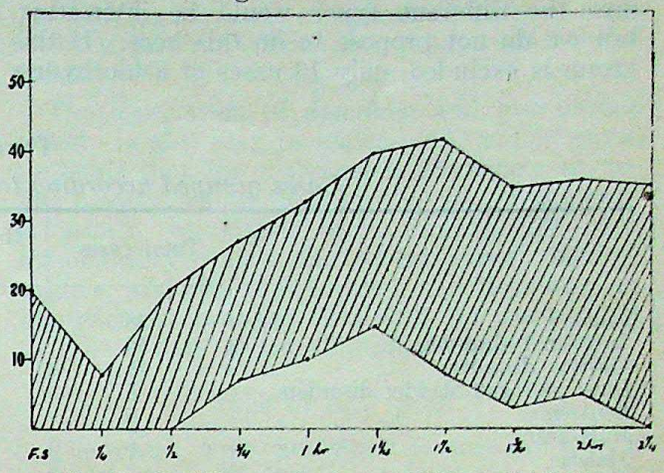

Fig. 8.—English standard range (Bennett, 1923).

Analysis according to diagnosis

We next attempted to classify the cases according to the diseases from which they were suffering in relation to their gastric acidity. The diagnosis as written on their case sheets at the time of discharge was taken; table VII shows the result of this analysis, but a considerable amount of grouping has been done.

TABLE VI

Showing the distribution of males according to their age and 'acid state'

	40 YEARS AND OVER					30 YEARS AND OVER					20 YEARS AND OVER					BELOW 20 YEARS				
	European	Bengali	Other Indians	All Indians	Total	European	Bengali	Other Indians	All Indians	Total	European	Bengali	Other Indians	All Indians	Total	European	Bengali	Other Indians	All Indians	Total
Hyperchlorhydria ..	2	6	1	7	9	2	6	0	6	8	1	3	0	3	4	..	1	0	1	1
High (Isochlorhydria.)	2	3	0	3	5	1	11	3	14	15	0	5	1	6	6	..	1	0	1	1
Medium (Isochlorhydria.)	4	4	2	6	10	2	7	2	9	11	1	9	1	10	11	..	1	1	2	2
Low (Isochlorhydria.)	0	4	1	5	5	1	6	2	8	9	..	4	5	9	9	..	2	1	3	3
Hypochlorhydria ..	1	1	0	1	2	3	2	2	4	7	..	4	0	4	4	..	0	0	0	0
Achlorhydria not tested	0	3	0	3	3	0	1	0	1	1	..	2	2	4	4	..	0	0	0	0
Achlorhydria c alcohol	..	..	..	..	..	0	1	0	1	1	..	1	2	3	3	..	0	0	1	1
Achlorhydria c histamine	..	..	..	..	..	..	..	..	..	..	..	0	2	2	2	..	1	0	0	0

TABLE VI(*a*)

	40 YEARS OR OVER		30 YEARS BUT UNDER 40		20 YEARS BUT UNDER 30		UNDER 20 YEARS
	Number	Per cent	Number	Per cent	Number	Per cent	Number
Hyperchlorhydria ..	9	26.5	8	15.4	4	9.3	1
Normal range ..	20	58.8	35	67.3	26	60.5	6
Hypochlorhydria ..	2	5.9	7	13.5	4	9.3	0
Achlorhydria ..	3	8.8	2	3.8	9	20.9	1
	34	..	52	..	43	..	8

We can afford to ignore the youngest group as the figures are so small. With the increase of age the incidence of hyperchlorhydria steadily

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The only outstanding feature in this table is the very high incidence of achlorhydria in the anæmia group. Further division of this group into the different types would be interesting, but we do not propose to do this here. If this group is excluded, only 13 cases of achlorhydria occur in 151 cases; this is an incidence of less than 9 per cent achlorhydria (to the alcoholic meal).

The further division of the other three larger groups is shown in table VIII.

TABLE VII

Cases grouped according to diagnosis and gastric acidity

	Total cases	Hyperchlorhydria	Isochlorhydria	Hypochlorhydria	Achlorhydria
Anæmia	58	5	34	6	13
Intestinal disorders	56	3	47	4	2
Gastric disorders	41	17	14	5	5
Liver and gall-bladder disorders	5	..	2	1	2
Leukæmia	5	..	4	1	..
Kala-azar	7	..	6	..	1
Malaria	4	..	3	1	..
Splenomegaly	7	..	4	2	1
Asthma	6	..	2	3	1
Skin diseases	2	1	1	..	..
Pellagra	1	..	..	..	1
Urticaria	2	..	2	..	..
Miscellaneous	15	2	11	2	..
TOTAL ..	209	28	130	25	26

TABLE VIII

Showing further subdivision of some of the larger groups in table VII

	Total cases	Hyperchlorhydria	Isochlorhydria	Hypochlorhydria	Achlorhydria
Gastric disorders					
Gastralgia	2	..	2	..	..
Dyspepsia	8	..	8	..	..
Ulcers	7	5	2	..	..
Cancer (?)	1	..	..	1	..
Hyperchlorhydria	12	12	..	..	..
Hypochlorhydria	6	..	2	4	..
Achlorhydria	5	..	..	..	5
TOTAL ..	41	17	14	5	5
Intestinal disorders					
Diarrhœa	8	..	5	2	1
Dysentery	24	2	20	1	1
Colitis	10	..	9	1	..
Sprue	3	..	3	..	..
Stasis	4	..	4	..	..
Pathological appendix ..	7	1	6	..	..
TOTAL ..	56	3	47	4	2
Miscellaneous					
Hookworm infection ..	1	..	1	..	..
Neurosis	1	..	1	..	..
Pulmonary tuberculosis ..	3	..	3	..	..
Opium addiction	1	..	..	1	..
Debility	1	..	1	..	..
Lymphangitis	1	1	..	..	..
Diabetes	2	..	2	..	..
Tumour of uterus	1	..	1	..	..
Epilepsy	2	1	1	..	..
Dengue	1	..	1	..	..
Hyperpiesis	1	..	..	1	..
TOTAL ..	15	2	11	2	..

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In the case of gastric disorders, this subdivision is very unsatisfactory as it is obvious that in almost every instance the diagnosis had depended on the result of the gastric analysis itself; take, for example, the diagnoses hyperchlorhydria, hypochlorhydria, and achlorhydria, whereas the words gastralgia and dyspepsia were evidently used when the gastric acidity was normal. And even the diagnosis of 'ulcer' was probably influenced by a finding of hyperchlorhydria.

Analysis according to symptoms

We decided therefore to re-analyse these cases according to symptoms. For this re-analysis we excluded all the anæmia group and 11 other cases in which there was both definite clinical dysentery (*i.e.*, blood and mucus in the stools) and a specific diagnosis of amœbic or bacillary dysentery, but otherwise took all patients who showed any prominent gastric or intestinal symptoms, including epigastric pain, flatulence, diarrhœa and constipation.

Of the 11 dysentery cases, 9 were within the normal range, one was hyperchlorhydric and one hypochlorhydric. The case-cards selected for re-analysis were grouped as follows (table IX) :—

TABLE IX

Cases grouped according to symptoms and gastric acidity

	Achlorhydria	Hypochlorhydria	Isochlorhydria	Hyperchlorhydria
Epigastric pain only ..	1	1	6	3
Pain + diarrhœa	1	1	9	1
Pain + constipation	..	..	8	6
Pain and flatulence ..	1	1	2	4
Pain, diarrhœa and constipation	...	..	2	2
Diarrhœa only	4	4	13	1
Diarrhœa and constipation ..	1	..	11	1
Constipation	..	2	3	..
Constipation and flatulence ..	..	..	1	..
Flatulence	1	1	4	3
TOTAL ..	9	10	59	21
Epigastric pain (all cases) ..	3	3	27	16
Diarrhœa (all cases) ..	6	5	35	5
Constipation (all cases) ..	1	2	25	9
Flatulence (all cases) ..	2	2	7	7

The noticeable points are as follows :—

(*a*) The high incidence (32.6 per cent) of hyperchlorhydria in cases in which pain was a prominent feature, or, to put it another way, the high incidence (76.2 per cent) of pain in cases of hyperchlorhydria.

(*b*) The incidence of low acid secretion, hypo- or achlorhydria, in cases where diarrhœa was the only prominent gastro-intestinal symptom. This was not so striking in those cases in which diarrhœa was associated with pain and/or constipation, but in this group the incidence of hyperchlorhydria was very low.

(*c*) The high incidence (61.1 per cent) of disordered acid secretion in cases in which flatulence is a prominent symptom.

The high incidence of epigastric pain in cases with hyperchlorhydria is what one would expect.

The association of diarrhœa and low gastric acidity is also easy to understand, and it seems probable that the diarrhœa is secondary to the low acidity rather than *vice versa*. Flatulence is usually associated with fermentation and hypomotility which one would expect in low acidity, and the high incidence of flatulence in hyperacidity probably indicates air swallowing to relieve pain as an additional cause.

Time of acid peak

The cases were analysed according to the time of the acid peak in relationship to race and sex. In the whole series the acid peak occurred most frequently at ¾ hour, but in a large number of cases it was at the ½ hour sample. There were no racial or sex differences. The time of development of the acid peak is much earlier in this series than in any British or American series reported.

Other features of the acid curve

The initial fall of acidity due to the dilution of the gastric juice was naturally not as marked with the smaller alcohol meal as it is with the gruel meal. Further, in a number of cases it was absent altogether; presumably the stimulation of the gastric mucosa was sufficiently rapid to counteract the diluting capacity of the 'meal'.

Table XI shows the incidence of this initial fall in the different racial and sex groups. Only 15 per cent of European males showed an initial fall in the curve against over 40 per cent

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TABLE X

Cases grouped according to time of peak of gastric curve

		'Fasting'	¼ hr.	½ hr.	¾ hr.	1 hr.	1¼ hrs.	1½ hrs.	1¾ hrs.	2 hrs.	2¼ hrs.
Europeans	Male	1	3	5	3	3	2	1	2	..	..
	Female	1	..	5	6	5	2	1	1	3	1
Bengal Indians	Male	9	3	15	21	8	8	6	4	5	..
	Female	..	..	2	5	2	2	1	..	1	1
Other Indians	Male	2	..	6	6	1	1	1	1	1	..
	Female	..	..	..	1	..	..	1	1	2	..
Others	Male	2	..	1	1	2	2	1	1	..	..
	Female	3	..	1	1	2	1	..	..	..	..
	TOTAL ..	18	6	35	44	26	18	12	10	12	2

TABLE XI

Showing separately the number of cases in each group in which there is an initial fall and a secondary rise in the acid curve

		Number in group	Number showing initial fall	Number showing secondary rise
Europeans	Male	20	3	9
	Female	31	2	10
Bengal Indians	Male	89	36	63
	Female	16	4	6
Other Indians	Male	28	6	11
	Female	6	1	2
Others	Male	10	4	6
	Female	9	3	3

amongst Bengal Indian males, the difference is considerable but not statistically quite significant as the numbers in the European group are small. Any difference that there is cannot be accounted for simply by the higher acidity in the European group because the percentage of initial falls is even lower in the female Europeans and is also comparatively low in the Other Indians group, in both of which the gastric acidity is very low. The same table shows the incidence of the secondary rise in the different groups, the highest percentage incidence is in Bengal Indian males, but there is little difference between the groups.

Fasting stomach contents

Table XII shows the amount of 'fasting' gastric secretion in 203 cases: in 6 cases the amount was not recorded. The mean amount in this whole series was 33.5 c.cm.; in 141 men

TABLE XII

Grouping of cases according to the amount of the 'fasting' content of the stomach

		FASTING CONTENT IN C.CM.						
		Up to 20 c.cm.	21–40	41–60	61–80	81–100	101–200	Above 200 c.cm.
Europeans	Male	5	8	5	1	..	1	..
	Female	11	15	1	3	..	1	..
Bengal Indians	Male	34	28	11	7	..	4 (106, 150, 154, 200)	1 (255)
	Female	5	7	4	..	..	..	..
Other Indians	Male	4	15	5	1	1	..	..
	Female	2	3	..	..	1	..	..
Others	Male	2	6	2	..	..	..	..
	Female	5	3	1	..	..	..	..
TOTAL ..		68	85	29	12	2	6	1
PERCENTAGE ..		33.5	41.8	14.3	5.8	1.0	2.9	0.5

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the mean was 35.7 c.cm. and in 62 women it was 29.0 c.cm.

In three-quarters of the cases there were 40 c.cm. or less of gastric secretion. There is a distinct difference between the men and women: in the former 72.5 per cent have a secretion of 40 c.cm. or less and in the latter the figure is 82.3 per cent. The difference (9.8 per cent) is just below the significance level (standard deviation = ± 6.5).

There is little difference in the amount of gastric secretion in the different racial groups.

The association of hyper-secretion and hyperchlorhydria

In table XIII the relationship of hyper-secretion and hyper-acidity is shown. In 28 cases of hyper-acidity, 11 show a secretion above 50 c.cm. in amount, and of the remaining 175 cases in which there is normal or deficient acid secretion only 20 show a secretion above 50 c.cm. The incidence of hyper-secretion in the hyperchlorhydric group is thus 39.3 per cent, whereas in the rest it is only 11.4 per cent. The difference, 27.9 per cent, is definitely 'significant', as the standard deviation is ± 7.3 per cent.

TABLE XIII

Showing the incidence of hyper-secretion in the hyperchlorhydric group

		Total number of cases	Number of cases in which fasting content is above 50 c.cm.
Europeans	Male	5	1
	Female	1	..
Bengal Indians	Male	16	8
	Female	1	..
Other Indians	Male	1	1
	Female	1	..
Others	Male	2	1
	Female	1	..
TOTAL ..		28	11

Summary

The current belief that the gastric acidity in Indians living in the tropical and sub-tropical parts of India is lower than that of Europeans living in temperate climates has been shown, by recent investigations on normal Indians at the Calcutta School of Tropical Medicine and elsewhere, to be incorrect.

Fractional gastric analysis, with alcohol as the test meal, was done in 209 hospital patients suffering from a number of different diseases. The series was a mixed one as regards race and sex.

The standards which we adopted arbitrarily for applying the terms hyper- and hypochlorhydria in individual cases are slightly higher than those used by British physicians.

Amongst our hospital patients, Europeans show the highest mean acidity and the highest incidence of hyperchlorhydria, Bengalis come next, and the lowest acidity is seen in 'other Indians' most of whom were Punjabis; the latter group showed by far the highest incidence of achlorhydria. The significance of this is not clear. The Bengali group included by far the largest percentage of vegetarians who were all rice eaters.

It is known that in South India rice eaters are notoriously liable to peptic ulceration and that the wheat-eating Punjabi is much less so, but this does not explain the high incidence in the meat-eating European; most of these were well-to-do and possibly the high incidence of hyperchlorhydria in this class was a sequel to alcoholic and dietary indiscretions and the accompanying gastritis.

Achlorhydria is not common in non-anæmic persons in India; the incidence is apparently, as far as can be judged from the literature, about the same or a little lower than that in Europe and America.

Hyperchlorhydria occurred in 16.3 per cent of men against 6.4 per cent of women, and achlorhydria in 10.2 per cent of men against 17.7 per cent of women: the difference is not statistically significant in either case.

Hyper-acidity is more common in the higher age groups.

The highest incidence of achlorhydria occurred amongst patients diagnosed as anæmia; this is the universal experience but only one case of true pernicious anæmia was included in the series.

When the cases were analysed according to the symptoms, there were noticeable associations between epigastric pain and high acidity, and diarrhœa and low acidity, respectively.

The 'acid peak' occurred early, about three-quarters of an hour after the 'meal', in all groups; this can probably be accounted for by the more rapid action of alcohol, as compared with gruel, in stimulating acid secretion.

In only a few instances was there an initial fall in the acid curve in the European group, in the other groups this initial fall was more frequent.

The amount of 'fasting' gastric secretion was higher in men than in women, the mean being 35.7 c.cm. in the former and 29.0 c.cm. in the latter. The amount of 'fasting' gastric secretion was 'significantly' higher in the hyperchlorhydric cases; this is the usual finding.

(Continued at foot of next page)

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THE RADIOLOGICAL EXAMINATION OF THE STOMACH AND DUODENUM

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THIS short outline is intended as a guide to the general practitioner. Radiology has in the past few years played an increasingly important part in the diagnosis of gastric and duodenal conditions. With improvements in apparatus the radiologist is now able to produce more and more accurate results. The reason of this is twofold. Firstly, with ample power now available in modern diagnostic units, exposures are reduced to speeds of the order of one-tenth of a second or even less than half of this. Secondly, by reason of methods of graduated and controlled compression, together with a device for radiographing appearances, the moment they are seen on the fluoroscope, much greater accuracy is attained. By means of these methods we are frequently able to demonstrate ulcer craters and other anomalies, which would otherwise be completely missed.

Case 1 is an example where by using an ordinary technique without compression the appearances of the stomach and duodenum were found to be fairly normal, whereas with the serial duodenal device, with controlled compression, a very distinct saccular structure was seen arising from the proximal portion of the second part of the duodenum. It was suggested that this might be a diverticulum, which was in fact found at operation. This is only one of many examples. In other instances, by this method I have been able to demonstrate very definite ulcers of which I saw no trace in the routine skiagrams of the stomach.

The rationale of any opaque meal examination consists of a delineation of :—

1. Outline.
2. Mucosal pattern.
3. Living structure.

The latter of course will be for the most part seen in the fluoroscope.

(*Continued from previous page*)

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It is important that, in order completely to fill all crevices, the opaque meal be of a completely homogeneous nature and held in proper suspension. It should not be gritty. Grit may cause spasm. Many preparations are on the market, most of which fulfil these conditions. They all consist of barium sulphate in a very fine state of division, held in suspension by either a gum or some other suitable material and variously flavoured, more often than not with chocolate.

Usually for an examination of the stomach and duodenum no purgation is necessary. Where the patient is constipated, however, it is advisable to give a mild purgative, such as two drachms of compound liquorice powder some thirty-six hours before examination. It is essential that the patient does not go to the radiologist in a starving state. A starved stomach is usually in a state of spasm, rendering examination of the mucosa difficult, if not impossible. In order to avoid this I always advise my patients to have a couple of slices of bread and butter or toast, and a cup of tea from two to three hours before coming to be examined. In certain cases where spasm is seen to be present this can be relieved by a small dose of belladonna or an injection of atropine.

It is essential for the radiologist to be provided with an accurate history of the case. It is to be remembered that radiology is merely one link in the chain of diagnosis, though usually in these cases a very important link. Such futilities, as sending a patient with a brief note 'A photo of the stomach', should be avoided.

The first procedure in the *x*-ray examination consists of a general survey. The lungs should always be screened. Many cases of dyspepsia can be traced to a phthisical origin. The diaphragm should always be examined and any limitation in movement or fixation noted. It should be seen whether the liver is normal in size or enlarged. Such details as gas in the stomach or intestine should be observed. It may be necessary in a stomach already full of secretion to empty this.

Having completed this general survey the patient is given a small quantity of the barium emulsion. The stomach is then palpated with the gloved hand and the emulsion suitably splashed about the walls, held here and there as necessary so as to show as much as possible of the detail of the mucosa. Quite often an ulcer crater will be visualized in this way as a small residue with spider-like folds of mucous membrane converging on it. Such a residue will usually be found to be tender. Following this films are taken with suitable compression by cone so as to show the mucosal pattern.

After this a full pint of the barium emulsion is given and the following features noted :—

(*a*) The general contour of the stomach.
(*b*) Tone.
(*c*) Peristalsis.

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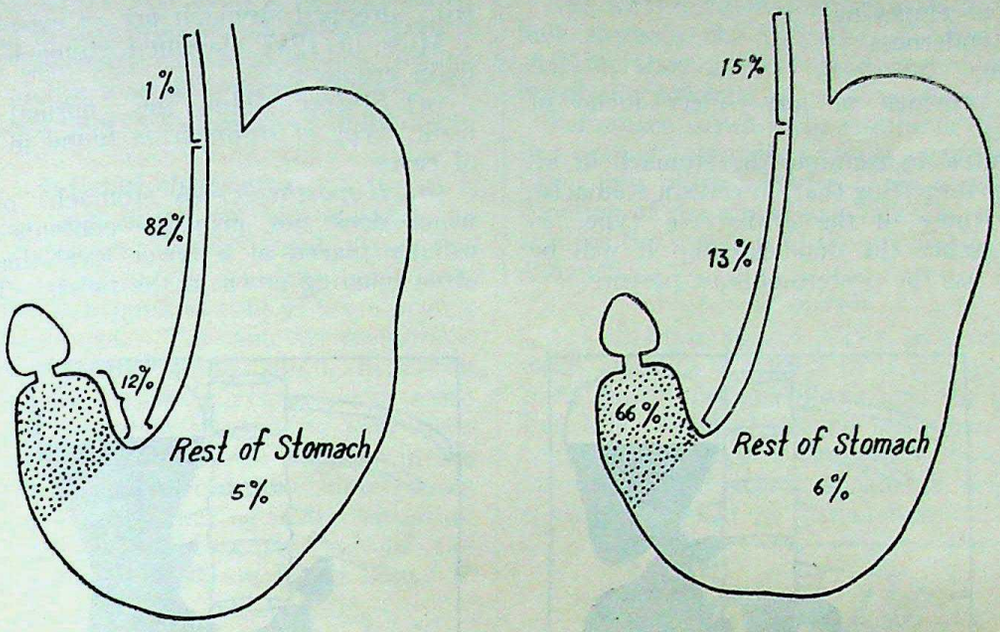
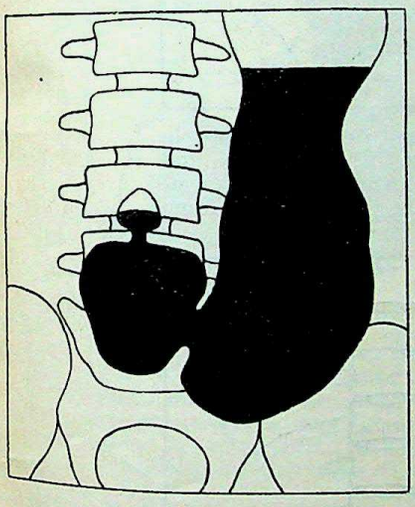
Diagrams showing the relative incidence of gastric ulcer and carcinoma.

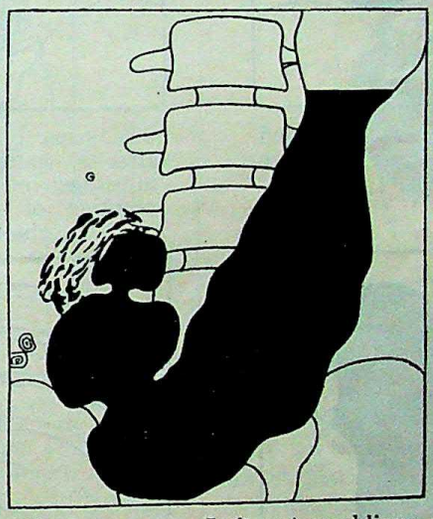


Ulcer. *Carcinoma.*

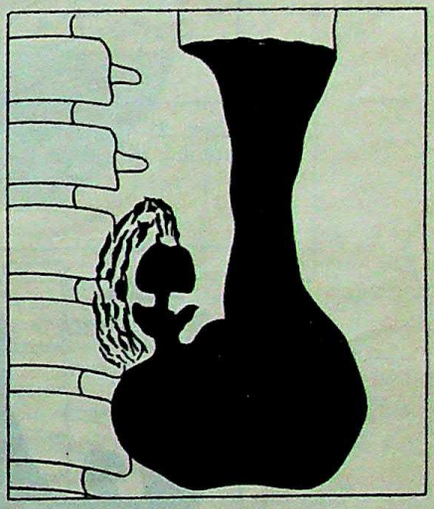
(From M. S. Stewart, *Lancet*, II, 565, and John Morley, *Brit. Med. Journ.*, 13th Nov., 1937.)



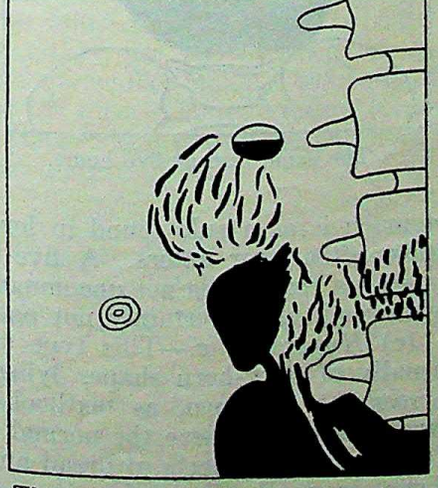
Case 1.—Anterior erect.



The same case. Left antero-oblique. Erect.



The same case. Right antero-oblique. Erect.



The same case. With compression. Erect. Anterior.

Erect. Left antero-oblique.

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(*d*) Mobility.
(*e*) Rate of emptying.
(*f*) Any tenderness.
(*g*) Spasm.
(*h*) The presence of any ulcer niche or irregularity.

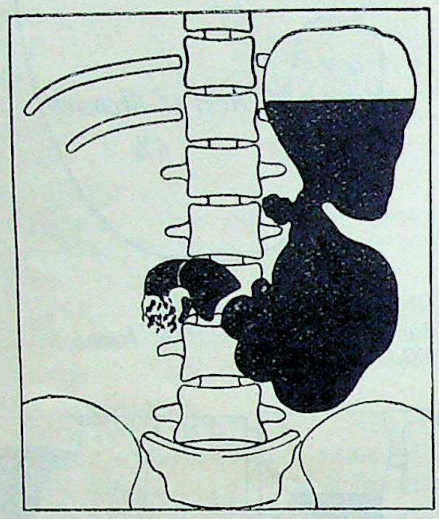
It is essential to examine the stomach in all positions, not forgetting that, in certain stomachs, particularly those of the transverse type, in order to visualize the duodenal cap it will be necessary to use the postero-oblique posture.

is extremely doubtful whether such a thing as truly dropped stomach *per se* exists.

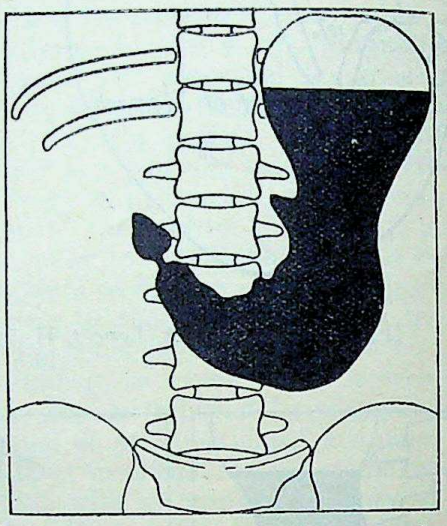
Mills in 1917 classified stomachs into three main groups :—

(*a*) *Sthenic.*—This, the normal J or 'fish-hook' type of stomach, is found in 70 per cent of cases.

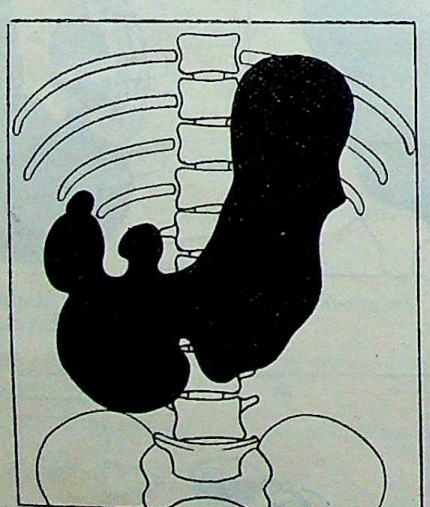
(*b*) *Hyposthenic.*—A stomach of low tone which does not grip its contents well and is usually placed at a lower level than normally, often hanging down in the pelvis. This type of



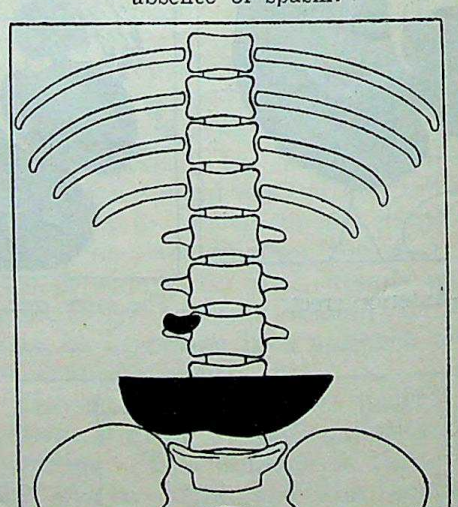
Case 2.—An example of 'niche and notch'. Ulcer of the lesser curvature and spasm.



The same case after three months after a course of Sippy diet and injections of Larostidin. Note the pointing of the ulcer crater and absence of spasm.



Case 3.—A very large ulcer at the lower end of the lesser curvature.



The same case at five hours.

Having examined the stomach we next turn to the duodenal cap, which is examined in an exactly similar manner.

An examination done five hours after the meal is always useful, as residues seen at this time are usually of some significance.

Types of stomach

It has been clearly understood for some years that the form taken by the stomach is largely a function of the subject's build or habitus. It

stomach is as a rule found in long, lanky subjects, often poor eaters. A five-hours' residue in such a stomach is not uncommon and like the stomach itself is certainly not pathological.

(*c*) *Hypersthenic.*—This type of stomach is usually of steer-horn shape, lying transversely across the abdomen, as textbooks of anatomy would have us believe the normal stomach does. It is found in subjects of broad and squat build. Tone is good. Peristalsis is increased, compared with that of the sthenic type of stomach

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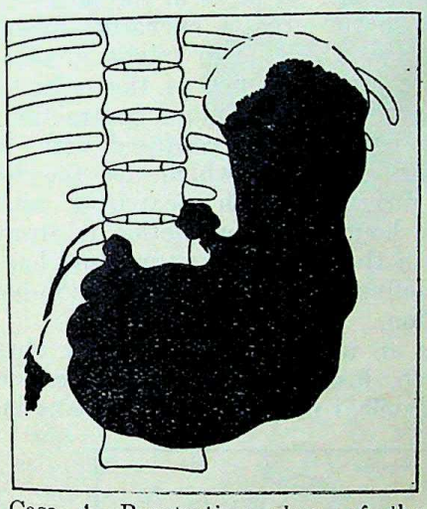
Such stomachs have a relatively high acid content and their owners have good appetites. More often than not in this type, in the antero-postero position, the duodenal cap usually lies behind the pylorus, giving a superimposed shadow. It can be well seen, however, with an oblique positioning.

Internal structure

The mucous membrane of the stomach is thick and glandular. It is fixed along the lesser curvature and at the pylorus, being free elsewhere. The sub-mucous coat is lax allowing fairly free movement. The mucous membrane is thrown into multiple folds, small near the attachment at the lesser curvature, and more voluminous and deeper at the greater curvature.

At the lesser curvature is seen a hiatus in the oblique fibres of the musculature. This causes an irregular contraction forming in this situation a sort of canal—the 'Magenstrasse' of the Germans. No oxyntic cells are found here. It



Case 4.—Penetrating ulcer of the lesser curvature. The prone anterior position in which this skiagram was taken is often the best one to demonstrate this type of ulcer.

is in this locality that about 90 per cent of gastric ulcers occur.

The mucosal pattern of a normal stomach should flow in regular folds. Any marked irregularities in these folds must be inquired into. In cases of ulcer they are usually seen to be puckered up in a spider-like manner, the body of the spider being the ulcer crater. Various forms of chronic gastritis produce coarsening and irregularities of these folds.

Tone

The normal stomach should tend to grip its contents and not bulge. Peptic ulcer is commoner in hypo-tonic stomachs with low acid contents.

A 'long' type of stomach has been described by Hurst in which traction on the mesentery occurs. Radiological examination in these cases does not show evidence of any inflammatory lesion and the pain associated with them is, as one would expect, relieved by lying down.

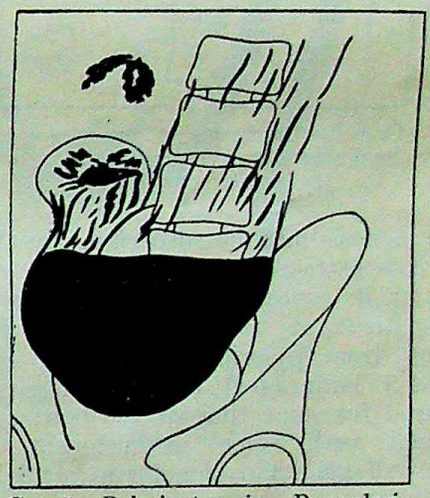
Peristalsis

The waves of peristalsis initiated at the cardia flow towards the pylorus. At first slow and shallow, they gather speed and depth as they reach the pylorus.

Peristalsis is not to be confused with tone. It has been shown within recent years by Graham, Cole, and other workers that peristalsis is a function of the muscularis mucosæ, whereas tone is more the function of the muscular coats of the stomach.

Spasm

(*a*) *Cascade spasm.*—The stomach in these cases assumes the form of a cup at the cardia from which the meal flows into the pars media. For this reason this type has been called the 'cup-spill' stomach. In most cases this appearance is undoubtedly of spasmodic origin and the spasm is relaxed by belladonna.



Case 5.—Pyloric stenosis. Pre-pyloric ulcer crater demonstrated as a residue at five hours. Note the large stomach retention.

(*b*) *Spastic incisura, or regional spasm.*—This may be a reflex phenomenon or the result of an ulcer, usually in the opposite wall.

Fraenkel has described a series of cases of very early ulceration in the lesser curvature where, though no ulcer can be demonstrated radiologically, there is definite spasm with lack of peristalsis in a small section of the lesser curvature.

Post-operative adhesions may cause either true spasm or appearances simulating spasm in the stomach. It is sometimes a matter of difficulty on radiographic appearances alone to exclude malignancy in such cases.

(*c*) *Pyloro-spasm.*—Spasm of the pylorus is often caused by a pre-pyloric ulcer. It may, however, be found in some cases of duodenal ulcer and reflexly as the result of other abdominal inflammatory lesions. A. C. Jordan has described this condition as being often associated with other spasmodic conditions, such as cardiospasm.

Emptying time

The rate of emptying of the stomach depends among other things on the nature of the food

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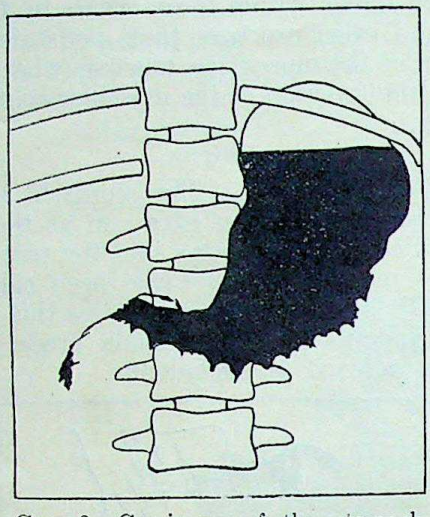
ingested. It is usually more rapid in the hypersthenic type of stomach. The stomach normally should be empty in five hours, but residues at six hours and more are not uncommon in hypotonia. This is not necessarily pathological. Where long retention is found in the stomach,



Case 6.—Carcinoma of the stomach involving the pylorus and most of the greater curvature.

pyloric stenosis may be suspected. In this condition it is extraordinary how long the stomach can retain its contents. There is a classic story of a patient at St. Bartholomew's Hospital suffering from pyloric stenosis who one day vomited a large bowl full of gastric contents. He stared for some time at the bowl and then exclaimed with some astonishment 'Ham! Ham!! I ain't had ham for a fortnight!'

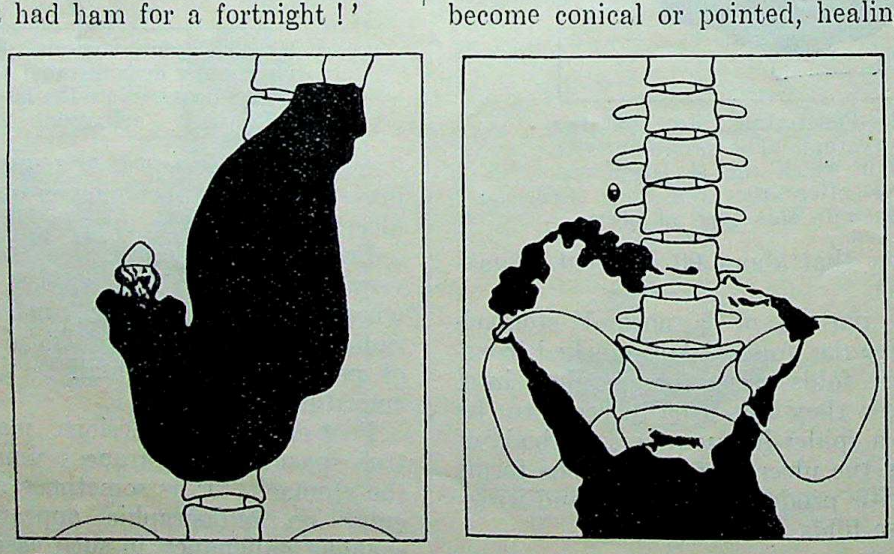
between the cardiac orifice and the incisura angularis.

An ulcer crater may be seen on the fluoroscope or skiagram either as a small niche or as a large diverticulum-like structure, sometimes with a gas bubble on top. It may be seen as a large pyriform filling defect. The shape of the crater, if seen, will naturally correspond to the underlying pathology. It must be borne in mind however that owing to the heaping up of the mucous membrane around a gastric ulcer the size indicated in the skiagram is apt to be deceptive.

It has been mentioned before that gastric ulcers may be demonstrated by the spider-like converging folds of mucous membrane, showing in the mucosal pattern. A residue and tenderness over the suspected crater are always of significance. The fixation of the portion of the lesser curvature in very early ulcerative or pre-ulcerative states has already been mentioned.

A characteristic feature very often seen in association with an ulcer in the lesser curvature is spasm in the greater curvature opposite. In certain cases this spasm might involve almost the entire circumference of the stomach, producing a pseudo-hour-glass contraction. This, however, is not to be confused with the true hour-glass stomach, which is the result of chronic ulceration with cicatricial contraction. The true hour-glass contraction is always more marked in the lesser curvature, and has not the clearly-defined outlines of the pseudo-hour-glass contraction.

Where an ulcer previously under observation is seen to lose its rounded appearance and become conical or pointed, healing is indicated.



Case 7.—Duodenal ulcer. Note the deformed cap with folds of mucous membrane converging on a crater and gas bubble on top. The second skiagram at five hours shows a residue in the crater.

Hyper-secretion

Hyper-secretion is easily seen on the fluorescent screen or skiagram by a less opaque fluid level lying over the dense barium emulsion.

Gastric ulcer

Russel Carman has estimated that 90 per cent of all gastric ulcers occur in the lesser curvature

In these cases, too, the spasm opposite is considerably lessened or absent.

Pyloric ulcer or pre-pyloric ulcer

This type of ulcer is usually difficult to demonstrate. They are often shallow and as cup-like as those in the lesser curvature; as a rule they cause pyloro-spasm, with steno-

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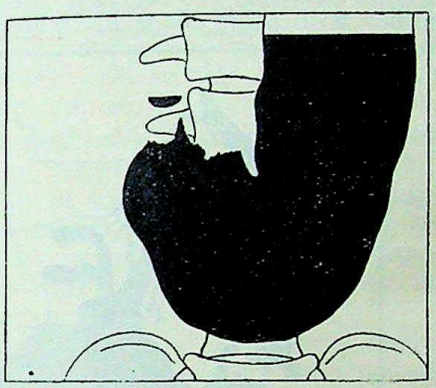
which may be really due to cicatricial contraction, or more often as the result of spasm.

It will be almost impossible to demonstrate a pre-pyloric ulcer with the stomach full of opaque meal. In these cases, one has to rely on indirect appearances and largely on the mucosal pattern. Indirect evidence is furnished by the spasm and the often dilated stomach, which is the result of spasm or stenosis.

Gastric carcinoma

The differential diagnosis between ulcer and carcinoma of the stomach is very often impossible in the early stages of the latter by purely radiological methods. In these cases it is essential carefully to consider the whole clinical picture. Quite a few cases have been reported where what appeared at the first examination to



Case 8.—Ulcer crater in the duodenal cap.

be a simple ulcer in the lesser curvature or pre-pyloric region has turned out on subsequent examination at a later period to be a cancer.

The radiological signs of carcinoma of the stomach consist of an irregular and constant filling defect often having crescentic impressions such as those a thumb might make on putty. There is always a lack of peristalsis in the affected area owing to the destruction of the underlying muscularis mucosæ.

Where the growth is at the pylorus an irregular conical narrowing of the lumen will be seen. In the ring type of carcinoma of the pylorus, emptying of the stomach is rapid as though the meal was passing through a rigid pipe. In these cases an associated ileus of the second part of the duodenum is seen in the majority of cases. Where the growth is not completely annular, on the contrary, spasm may be induced at the pylorus.

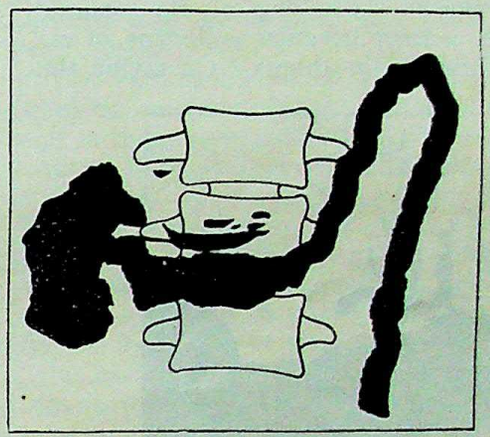
The question of spasm in the stomach is often very confusing, in doubtful cases, alkalis and belladonna or sometimes gentle palpation while screening will clarify things. The relative regional incidence of gastric ulcer and carcinoma is seen in the accompanying diagrams. It will be seen that whereas the vast majority of gastric ulcers are situated in the lesser curvature, the seat of election of gastric carcinoma is in the pyloric region. In carcinoma of the cardiac end of the stomach, the chief clinical symptom is dysphagia, due to stenosis at the cardiac orifice. Examination shows a filling defect at the cardia, sometimes invading the lower end of the œsophagus.

Diverticulum of the stomach

These saccular excrescences are not very common. They usually occur high up in the cardia, and have a smooth outline with no tenderness or associated spasm. They often remain filled for a considerable time.

Leather bottled stomach

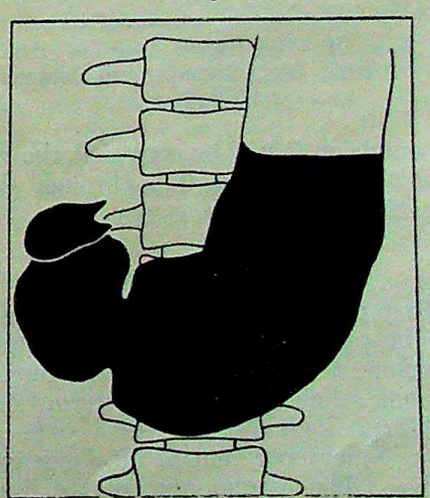
This condition consists of a fibrous carcinomatosis. The stomach presents a rigid steer-horn appearance with an almost or absolutely complete lack of all peristalsis.



The same case at five hours. A very small stomach residue seen, and a distinct residue in the ulcer crater.

Gastric syphilis

This is characterized by a contracted stomach with thickened, hypertrophied and irregular folds of mucous membrane. Rigidity is usually present. There is no palpable tumour felt in



Case 9.—Penetrating ulcer of the duodenum.

these cases. Often there may be an hour-glass deformity with no demonstrable ulcer crater.

Tuberculous disease of the stomach

This is exceedingly rare. The radiographic appearances are similar to those of syphilis.

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Polyposis

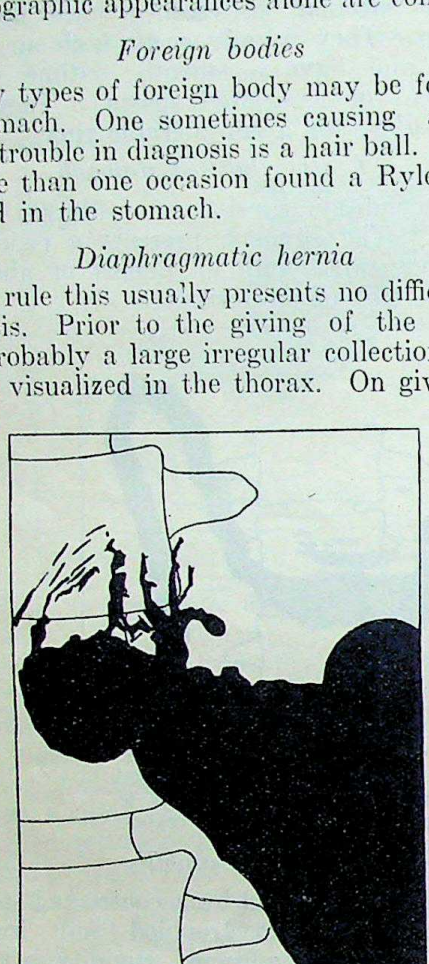
These growths show in the skiagram as irregular rounded filling defects, usually with a smooth outline. In extensive cases the diagnosis from malignant disease may be difficult so far as radiographic appearances alone are concerned.

Foreign bodies

Many types of foreign body may be found in the stomach. One sometimes causing a good deal of trouble in diagnosis is a hair ball. I have on more than one occasion found a Ryle's tube retained in the stomach.

Diaphragmatic hernia

As a rule this usually presents no difficulty in diagnosis. Prior to the giving of the opaque meal probably a large irregular collection of air will be visualized in the thorax. On giving the



Case 10.—Penetrating ulcer of the duodenal cap. Right antero-oblique position.

opaque emulsion it will be seen that the stomach or even more has herniated through the diaphragm into the thoracic cavity.

THE DUODENUM

The first part of the duodenum, immediately beyond the pyloric ring, is seen in opaque meal examinations as a cap-shaped structure, rather like a monk's hood. Hence the term 'duodenal cap'. Morphologically this is a part of the stomach. Ninety per cent of all duodenal ulcers occur here. The second part of the duodenum points vertically downwards curving over the head of the pancreas to reach the third part which proceeds to the left to its continuity with the jejunum.

Filling defects

Filling defects of the duodenal cap may be, as anywhere else in the gastro-intestinal tract, the result of extrinsic or intrinsic causes.

Very often a crescentic filling defect is seen on the cap or pyloric portion of the stomach, due to pressure of the gall bladder. Often owing to deficient tone the duodenal cap is enlarged and on emptying two pouches at the base remain filled with the opaque material.

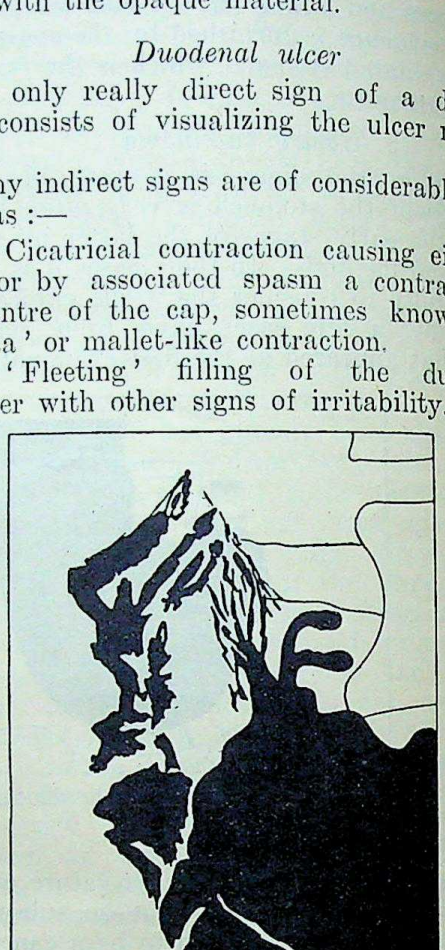
Duodenal ulcer

The only really direct sign of a duodenal ulcer consists of visualizing the ulcer niche or crater.

Many indirect signs are of considerable value, such as :—

(1) Cicatricial contraction causing either by itself or by associated spasm a contraction in the centre of the cap, sometimes known as a 'kinuta' or mallet-like contraction.

(2) 'Fleeting' filling of the duodenum together with other signs of irritability.



Case 11.—Double penetrating ulcer at the base of the cap.

(3) Hyper-secretion.
(4) Pyloro-spasm, unaccounted for otherwise.
(5) Tenderness over the cap.
(6) Residues in the stomach at five hours.

As in the stomach, many types of ulcer are seen in the duodenum ranging from the flat type of superficial ulceration following duodenitis to deep penetrating ulcers.

Duodenitis

In this very common condition, often pre-ulcerative, a coarse reticulation is seen in the mucosal pattern, often associated with spasm. In many cases the cap appears contracted owing to engorgement of the mucous membrane. Tenderness is usually present. In many cases a bubble of gas is seen at the apex of the cap in cases of duodenitis and duodenal ulcer. Wilkie and others have pointed out what is now a commonplace, *viz*, the very constant association of duodenitis with chronic appendicitis and cholecystitis.

(Continued at foot of opposite page)

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Air Warfare and

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tions for the early treatment of air warfare casualties.

(1) A lecture delivered at the Air Raid Precautions Exhibition at Olympia, London, on the subject of Aircraft Defence, on 7th February, 1938.

(2) This investigation was commenced under a grant from the Indian Jubilee Research Fund Association and during the last year has been carried on under the Endowment Fund of the Calcutta School of Tropical Medicine.

(*Continued from previous page*)

Diverticulum of the duodenum

This when present usually occurs in the second part. It is very rarely found in the first part and occasionally in the third. These sacs are not merely a herniation of the mucosa through weak spots in the musculature. They are probably true congenital sacs and are covered by all the muscle coats of the duodenum.

In the second part of the duodenum, diverticulæ usually retain their meal for long periods —often for twenty-four hours or longer.

Gastro-jejunostomy appearances

All cases of gastro-jejunostomy should be examined as soon after operation as they are able to get about, in order to ascertain the efficiency or otherwise of the operation.

It will be found in the vast majority of cases that the patient has not changed his habits and that as much meal as a rule will take the old route as the new unless something has been done to obliterate the old canal. Usually in three weeks or so, valvular action will have been established at the stoma.

Jejunal ulcer

In 2 per cent of cases of gastro-jejunostomy, jejunal ulcer occurs, usually within nine months of operation. Pain is felt soon after meals, rather lower down than in peptic ulcer and as a rule more to the left.

Sometimes an ulcer crater can be demonstrated by *x*-ray examination, more often not. The disturbance of the normal relationships, together with post-operative adhesions, makes diagnosis in these cases very difficult. Indirect signs of value are :—

(1) Spasm and closure of the stoma.
(2) Hyper-secretion.
(3) Persistent irregularity about the stoma.
(4) Tenderness.
(5) Persistent stomach residues.

The method of mucosal examination by controlled pressure is of the greatest importance here.

OKING HABIT IN INDIA

General survey

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R.C.P. (Lond.)
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and
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edicine, Calcutta)*

orical and general

tle doubt that the medicinal opium were known from very and that its euphoric uses were dis- The employment of this drug for its pleasure-giving effects spread very rapidly after their discovery and became so extensive in the East that prohibitory edicts and enactments were promulgated by rulers to prevent the spread of the habit. In spite of this, opium claimed more and more devotees. The drug was at first taken only by the mouth, but later, after the introduction of tobacco, it was smoked. Tobacco smoking is said to have been started in Asia first in the Philippine Islands by the Spaniards and from there it spread to China in the beginning of the seventeenth century. It would appear that in the early days of tobacco smoking various substances were mixed with it either to counteract its unpleasant effects or to strengthen the pleasant ones. Arsenic was one of these substances and opium was another.

The earliest record of the use of opium for smoking purposes is by Kampfer who in the end of the seventeenth century saw the inhabitants of Java offering for sale tobacco soaked in a solution of opium in water. In A.D. 1726 Francois Valentyn, a Dutchman, described the presence of 'modak' smokers among them. With the Dutch conquest of Formosa, the custom spread to that island and also to China. By the beginning of the eighteenth century, the habit had become so widespread that the authorities in the latter country were greatly alarmed regarding the evil effects which were being produced by it. In 1729 the first anti-opium edict was published by the then Emperor. In a Chinese work published in A.D. 1746 and translated by Dr. Edkins, opium smoking is described as follows : 'Opium for smoking is prepared by mixing hemp and grass cloth plant and cutting them into small pieces. This is then boiled in water with tobacco and smoked. This was the method in which it was smoked in these countries and China before the eighteenth century'. In 1796 the import was officially forbidden and opium smoking was made an offence punishable by death.

The Persians took to eating of opium early but there is no mention of opium smoking among them in the records of 'Kampfer's Travels', nor in those of Tavernier's (1657–70), though both describe eating and the smoking of 'hashish'. It appears to have been introduced later, probably after the Portuguese brought tobacco to the Persian Gulf in the early part of the seventeenth century. The Persians then became great smokers of tobacco and learned to grow tobacco themselves and invented the water-pipe (qalian). They, however, never used the water-pipe for smoking opium though 'hashish' mixed with tobacco was occasionally smoked in it. Persians themselves admit that smoking of opium was unknown in their country until the nineteenth century and mention that the practice among them is not more than 110 years old. Other authorities assert that it did not begin there till after 1850. All agree that opium smoking was begun in

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Khorassan, the north-eastern province of which Meshed is the capital. Here the famous shrine of Imam Rezah is situated and here are attracted thousands of Shiah Mohammedan pilgrims from all parts of the world every year. It is a fair assumption, therefore, that opium smoking was first brought into Persia by pilgrims to Meshed. Certain it is that the Khorassanis are to-day more addicted to it than the people of any other province in Persia.

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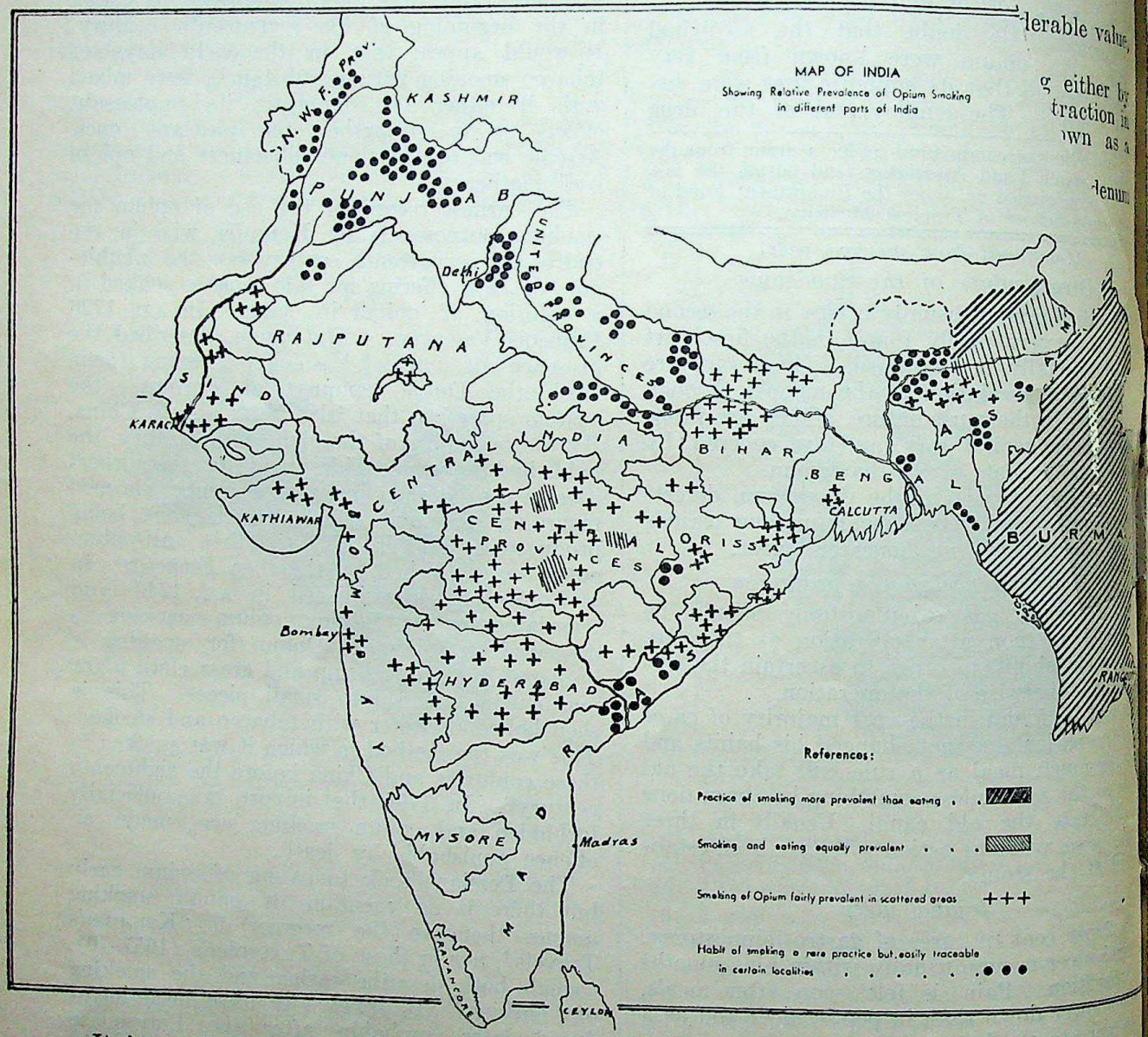

It is worthy of note here that before the Great War large quantities of morphine were sent to China in the form of packages of a proprietary cure for the opium smoking habit; a cure it might have been but it produced another vice infinitely worse. Opium smoking was in vogue in some parts of the United States where it was undoubtedly introduced through the agency of the Chinese immigrants.

Introduction of opium smoking habit in India

Opium, in all probability, was introduced into India by the nomadic Arab traders and invaders. That the drug was extensively taken

smoking of opium in India, although it prevail
in China. Exactly when the preparations ma
for smoking were first introduced and the hab
of smoking opium first obtained a foothold
India is not quite clear. Fortunately, it nev
assumed such a menacing aspect as it did
China. The Royal Opium Commission of 18
described the habit as 'comparatively rare
novel' in India.

A careful consideration of the available da
points to the possibility of introduction of opi
smoking in India by Mohammedan traders fr
Persia and Afghanistan. The stimulating
the narcotic properties of the drug combine

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1938

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Air Warfare and of decline of the Moghul

By L. H. G

(From the *Practitio*

g of opium smoking in India

Ir air war should jo moking opium is considered so
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pro is of indulge in smoking, and it would have been
th possible to form even an approximate idea of
e ne prevalence of the habit without their active
co-operation.

some of the old Hindustani books very detailed and somewhat exaggerated descriptions are to be found of this habit and the effects produced by it. Opium dens are found in many of the large towns in India even to the present day, but the proportion of people who smoke the drug is very small at the present time. Its incidence among the people is very irregular and, although there are areas and certain classes of the population which are badly affected, these fortunately form a very small minority.

Our enquiries show that the habit of smoking opium in one form or other is met with on a small scale in many of the large towns in India. The practice is at present confined to the poorer classes. A general survey of the incidence of the habit was carried out in different provinces and the results are briefly given in table I. It may be stated here at once that the habit of opium smoking has considerably decreased in India during the last 30 years. According to some authorities the reduction has been by as much as 75 per cent. Opium smoking, however,

TABLE I

Showing the total consumption of opium in different provinces in 1932-33, *the approximate number of smokers and the localities affected*

Provinces	Total consumption in lb.	Approximate number of addicts	Localities where the habit is reported to be still in vogue to an appreciable degree.
Madras	59,782	5,000 to 6,000	Ganjam, Vizagapatam, East Godaveri and West Godaveri districts and Madras town.
Bombay	38,084	900 to 1,000	Bombay, Ahmedabad, Poona, Sholapore, Broach, Ahmednagar, Surat, Nasik Thana.
Sindh	8,216	2,000 to 4,000	Hyderabad, Sukker, Mirpur Khas, Shikarpore and Jacobabad and Karachi.
Bengal	56,180	6,000 to 7,000	Calcutta and suburbs, Murshidabad, Dacca, Chittagong, Barisal and Darjeeling districts.
United Provinces ..	39,978	2,100 to 3,000	Shaharanpur, Bulandshahr, Muttra, Bareilly, Aligarh, Benares, Cawnpore, Agra, Fatehpur, Allahabad, Farrukhabad, Etawah and Gorakhpore districts.
Punjab	63,082	800 to 900	Lahore, Multan, Gujranwala, Jullunder, Rawalpindi, Ambala, Ferozepore, Ludhiana, Amritsar and Sialkot districts.
Burma	43,625	3,000 to 4,000	All over the province particularly in Northern and Southern Shan States and in all towns and Arrakan areas.
Bihar	38,493	6,000 to 8,000	Shahabad, Saran, Champaran, Muzaffarpore, Bhagalpore, and Singhbhoom districts.
Orissa	..	2,000 to 3,000	Orissa province as a whole and towns like Cuttack and Puri.
Central Provinces ..	25,388	12,000 to 15,000	Narsingpur subdivision, Nagpur, Ellichpur, Balaghat, Jubbulpore, Akola, Amraoti, Buldana, Yeotmal, Wardha, Rajpur, Bilaspur and Mandla districts.
Assam	26,765	20,000 to 25,000	Hill tracts particularly Sadiya frontier tracts, Makir hills of Nowgong and Sibsagar districts.
North-West Frontier Province.	1,682	3,000 to 5,000	Towns like Peshawar, Kohat, Hoti Mardan, Dera Ismail Khan and Bannu.
Administered areas (Baluchistan, Ajmer-Merwara, Coorg and Delhi).	10,922	200 to 400	Delhi and Ajmer towns.

A study of the records leaves little room for doubt that opium smoking has always been an uncommon practice in India. That it did exist and does exist even now among certain classes is evident from the fact that the word 'chandubaz', or opium smoker is well known and in

appears still to be practised in many of the large towns among the lower strata of the society.

In the following pages we give the information we have gathered with regard to its prevalence in different parts of India.

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Opium smoking in Assam

During the latter part of the seventeenth century, when the Moghuls came in contact with the kings of Assam, it is probable that some time or other opium or 'affing' as it was called was sent as a present to the Assam (Ahom) kings. It would appear that from about this time the habit of eating opium was introduced into Assam. Neither the available literature nor the local chronicles, which describe the details of the royal functions and the events of each day before the eighteenth century, have any references either to poppy cultivation or habitual use of opium among the people of Assam. That the royal court indulged freely in the drug by the end of the eighteenth century, can be gathered conclusively from the report of Captain Welsh in 1792 to Lord Cornwallis. He describes the King Gaurinath Singha, as 'a poor debilitated man, incapable of transacting business, always either washing or praying and, whenever seen, intoxicated with opium'. Again, in Captain Welsh's report we read further, that he required 'a few boat loads of opium for sale because it was useful for the purchase of rice, etc., for the troops'. It is not exactly known when the drug was first introduced into the Assam valley but it is certain that poppy was widely cultivated there in 1773, and its use became so extensive in the nineteenth century that measures had to be taken to prevent its abuse. It was observed by one of the writers of that period that three-fourths of the population were habituated to opium.

There appears to be little doubt that the habit of smoking opium was introduced into the valley by clandestine methods from the north. In Assam the inhabitants, for some reason, gave themselves up completely to the drug and opium smokers have always formed a considerable portion of the indigenous population of Assam. The Kacharis were so passionately addicted to it that they sometimes demanded to be paid in opium instead of money. Both men and women among the Kakhyens, Karens and Lpais, the inhabitants of the Khasi mountains, smoked opium. They could produce only very small quantities of the drug on account of the high altitude in the mountains, but they obtained large quantities from China. The wild tribes of Turungs and Nagas descended from their hills into the valleys in order to barter ivory, for rice and opium. Certain tribes of the adjacent parts of Burma, the Parjii and the Kachion, are badly addicted to this habit.

Opium smoking is said to have increased in Assam after the prohibition of poppy cultivation in 1860. Some of the old addicts whose memory goes back to that period state that only about 5 per cent of the consumers were smokers at that time. Probably the form in which opium was then commonly manufactured was not suitable for smoking purposes. The habit later spread rapidly and practically every opium addict preferred to smoke it if he could afford to do so. Amongst

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Similarly, the poorer classes have to give
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According to the estimate we have formed b
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smokers to opium eaters in the province of
Assam as a whole at the present time is one-
fourth and not one-half or one-third of the to
opium habitués, as the Botham Commit
(1912) and Assam Congress Inquiry Commit
(1925) respectively reported. In some pla
figures may be higher. In Lakhimpur Sadi
frontier tract, for instance, we found that th
proportion of smokers to eaters was 4 to 11 i
several localities, but this is not the case in
other parts of Assam. The reason why the pre-
portion of smokers is put down to be high b
some people is partly because the evils of smok
ing bulk large in their view, and partly becaus
they are apt to confuse the number of those wh

TABLE II

Showing incidence per 10,000 *population and also total consumption in pounds in various districts of Assam during the year* 1932-33

District	Consumption in lb: during the year 1932-33	Incidence per 10,000 of population in lb.
Kamrup	1,740	17.8
Goalpara	58	0.64
Cachar	852	14.8
Sylhet	124	0.44
Khasi and Jaintia hills ..	694	23.8
Naga hills	448	25.0
Balipara frontier tract ..	38	63.8
Darrang	2,676	44.0
Nowgong including Mikir hills.	3,052	54.0
Sibsagar including Mikir hills.	8,548	90.0
Lakhimpur	5,084	124.0
Sadiya frontier tract ..	1,008	188.0
Whole province ..	28,448	30.6

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on of opium smoking in Assam

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The prac viz, pper districts of Assam valley,
(1) A ' ructu in the hill tracts and the Sadiya
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(2) is inte ween 122 to 188 lb. per 10,000 of
stance, ibri n and the opium conference at Simla in
on the s arked these as 'black spots' in the prov-
(3) m This unusually high consumption is due
pro is of smoking of opium, which necessitates a much
th rger dosage of opium per head than taking it
by the mouth. We have observed that opium smoking is commoner among the hill tribes. In the plains much less opium is consumed, the consumption being the highest in Lakhimpur district (124 lb. per 10,000 population per annum) and lowest as one goes southwards, *i.e.*, in Nowgong district (34 lb. per 10,000 persons per annum). The districts of Sylhet and Goalpara have a consumption even lower than the League standard, being 0.44 and 0.64 lb. per 10,000 per annum. The consumption is high in Khasi and Jaintia hills and Balipara frontier tract where it reaches 73.8 lb. per 10,000. The comparatively high consumption rate in Cachar is due to the fact that Northern Cachar hills are malarious and the labourers employed there in the timber industry smoke the drug under the belief that it has a prophylactic value. Out of the total population of 32,844 there were 1,338 pass holders (4 per cent of the population); this works out to be 1 in 25 of the population. The average consumption per month per individual is 270 grains.

In table III we have given the comparative figures of consumption of opium in the hill and plain areas of two districts in which the incidence of the opium habit is high. Sibsagar and Nowgong districts adjoin each other and have a common hilly tract called Mikir hills and the inhabitants of this area are particularly fond of opium smoking.

This table is of special interest inasmuch as it shows that the incidence of addiction to opium in the hill areas is almost five times that in the plains; for example, it is 172 lb. in the Sibsagar Mikir hills as compared to 34 lb. per 10,000 in the plains of the same district. There are proportionately more habitués in the hill areas, the proportion to total population being 1 in 19 and 1 in 34 in the hill areas of the two districts respectively as compared with 1 in 71 and 1 in 52 in the plains of the same district. Further, it will be seen that the average monthly allowance of each district is practically the same in the two areas, indicating that the mode of consumption is probably the same, *i.e.*, smoking.

To sum up briefly, the consumption of total excise opium in the whole of Assam including Manipur State was 26,765 lb. during 1932-33.

TABLE III

Showing difference in consumption and the number of consumers on the register in plain and hill areas of Sibsagar and Nowgong districts in 1932-33

	Total consumption in lb.	Incidence per 10,000 population according to census of 1931	Average monthly consumption per individual in grains	Number of consumers on the register	Percentage of pass holders to general population	Total population according to census of 1931
Plain areas						
Nowgong district	1,702	34	145.8	6,950	1 in 71	484,831
Sibsagar district	7,866	88	270.0	17,399	1 in 52	877,960
Hill areas						
Nowgong district	1,350	172	198.0	4,016	1 in 19	77,750
Sibsagar district	682	122	212.0	1,628	1 in 34	55,466

The total population of the province according to the last census report was 9,247,857 and the incidence of opium consumption per 10,000 of population per annum works out to be 30.6 lb. per annum as compared with 84 lb. in the 'black spot' area and 29.4 lb. in plain areas and 38 lb. in the Mikir hills, North Cachar hills, frontier tract of Sadiya and Balipara, and Manipur State. The addiction is uncommon in Lushai and Garo hills. In Manipur State the incidence is very low, *i.e.*, only 2.8 lb. per 10,000 of population per annum.

Number of consumers in the province.—The number of registered opium addicts in various

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districts of the province and the average daily dose are shown in table IV.

TABLE IV

Showing the number of registered opium addicts in various districts in Assam province during the year 1932-33 *and average daily dose*

Districts	Number of registered addicts	Proportion of the registered pass holders to general population	Average daily dose in grains
'Black spot' areas			
Darrang ..	7,602	1 in 77	7.02
Nowgong ..	10,966	1 in 51	5.52
Sibsagar ..	19,027	1 in 49	8.94
Lakhimpur ..	20,414	1 in 35	8.58
Sadiya frontier tract.	1,665	1 in 32	12.06
TOTAL ..	59,674	1 in 48	7.96
Other areas			
Kamrup ..	4,576	1 in 213	7.2
Goalpara ..	153	1 in 5,769	7.2
Cachar ..	2,085	1 in 273	7.8
Sylhet ..	411	1 in 6,628	6.0
Khasi and Jaintia hills.	1,765	1 in 164	7.8
Naga hills ..	671	1 in 266	13.2
Balipara frontier tract.	56	1 in 91	13.2
TOTAL ..	69,391	1 in 126	6.8

As regards the actual number of opium addicts in these areas, the survey we have made leads us to believe that the actual figures on the official register do not represent the true number of addicts and that there are at least half as many more addicts who still remain unregistered and consume the drug obtained from various illicit sources. As regards the proportion of pass holders to general population they form the smallest percentage of population in Darrang—1.29 per cent. The number is very high in the Mikir hills of Nowgong district where they form 5.1 per cent. Taking the whole population in the province, excluding Manipur State, there is one pass holder for every 126 persons as compared with 1 in 48 in the case of 'black spot' areas. According to the estimate we have formed there would approximately be between 20,000 to 25,000 smokers in this province.

Average daily dose.—A perusal of table IV will show that the average daily consumption per pass holder is highest in Sadiya frontier tract, being 12.06 grains a day, and is the lowest in the Nowgong plain areas where it is 4.86 grains a day. For the 'black spot' areas as a whole the average dose per registered addict works out to be 2,700 grains a year, 225 grains a month, or 7.86 grains a day, [illegible] 6.8 grains per day of other [illegible]

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TABLE V

Showing opium consumption per 10[illegible] either by [illegible]tion in *'black spot' areas of Assa*[illegible]ction in *in pounds during the years* 1920-2[illegible]vn as a *and* 1932-33

[illegible]enum

'Black spot' areas	CONSUMPTION IN L[illegible] 10,000 OF POPULATIO		
	1920-21	1927-28	1932-33
1. Darrang	344	118	44
2. Nowgong with Mikir hills.	582	240	51
3. Sibsagar with Mikir hills.	336	180	90
4. Lakhimpur ..	610	284	124
5. Sadiya frontier tract ..	..	..	188
6. 'Black spot' areas as a whole.	458	206	84
Province as a whole ..	161.6	72.2	30.6

The reduction in opium consumption during the past 16 years is undoubtedly the result of registration of addicts, the reduction in number and rationing of shops, the enforcement of the Opium Smoking Act, and also the 10 per cent reduction in the annual ration of each addict. It appears that the consumption of opium was rather alarming during the year 1920-21, before the restrictive measures were adopted. As a result of these measures the habit of smoking opium, in many localities, has been replaced by that of eating which is satisfied by smaller quantities of the drug. In 1920-21 the consumption of the drug in 'black spot' areas was 458 lb. per 10,000 of population, in 1927-28 it fell to 206 lb. while in 1932-33 it dropped to 84 lb. only. Not only do the 'black spot' areas show marked decrease but the incidence in the whole province also has fallen simultaneously from 161.6 lb. per 10,000 population during 1920-21 to 72.2 lb. (by 55 per cent) in 1927-28 and it has further dropped in 1932-33 to 30.6 lb. Taking the province as a whole the consumption of the drug has fallen from 129,190 lb. during the year 1920-21 to 57,766 lb. during the year 1927-28 and to 28,448 lb. during 1932-33. Thus the present consumption has come down to even less than one-fourth of what it used to be 16 years ago. This wide range in variation can be duly explained by the fact that most of the smokers have now taken to opium eating.

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oking in the Central Provinces

carried out a detailed survey of the
of this habit in this province during
w years and find that its incidence is
as compared with some of the other
of India. It is not exactly known
the habit was introduced into this
The Opium Inquiry Committee
929) reported that 'the opinion is pretty
generally expressed that the habit, especially
that of "madak" smoking, began among the
Mohammedans and this fits in with the fact
that at present the habit is most prevalent in
that community and with the high consumption
in Ellichpur, which is largely a Mohammedan
town'. The cultivation of poppy was started
in this province about 200 years ago and the
information available goes to show that smok-
ing was introduced nearly a hundred years
later. It would appear that the habit of smok-
ing was first contracted by a few rich land-
owners of the province from their retainers, who
were generally Mohammedans from outside.
It proved enjoyable in company, began to
acquire a social value and at one time it was
common for a smoke of opium to be offered to
guests and visitors as a mark of hospitality.
Moreover, opium was very cheap in former days
and was easily obtainable anywhere. 'Madak'
smoking thus spread extensively in some local-
ities where the idle rich class of landholders
resided. In the districts of Berar it is quite
likely that the habit was originally introduced
by the Mohammedan rulers who hailed from
Persia. This legacy has thus been handed
down to the people and opium smoking was in-
dulged in in spite of restrictions that were later
introduced. The Opium Smoking Act has
been in full force since 1932; according to this
Act smoking is an offence. It has, however,
not been possible in practice to suppress the
offence entirely. The excise authorities have
been able to check smoking in assemblies, but
the individual smoking of the drug in secret
still continues and is difficult to detect. The
opium law in the province was further strength-
ened in the year 1934 by making it unlawful
for any person to smoke opium and to possess
a pipe or any other apparatus for smoking or
preparing opium for smoking purposes. It would
appear from the study of table I that the total
consumption of opium during 1932-33 was
25,388 lb. and the number of smokers on
official record was 10,345, a figure probably
somewhat on the low side.

'Madak' is the preparation which was prin-
cipally used for smoking in this province. The
types of persons given to opium smoking are
low-class Mohammedans, artisans, hackney
carriage drivers, and a few agriculturists. It is
a vice of the urban rather than of the rural areas.
The incidence is high in Narshingpur subdivision
and the habit is also fairly prevalent in the
adjoining areas of Hoshangabad and Jubbulpore
districts. There are also a large number of
habitués amongst the Mohammedan popula-
tion of Ellichpur, Balaghat, and Jubbulpore
towns. In certain areas of Akola, Amraoti,
Buldanha, Yeotmal and Wardha districts, the
habit also exists in the lower strata of society.
Opium smoking has also spread to certain dis-
tricts inhabited by the aboriginal tribes—
Raipur, Balaghat, Bilaspur, and Mandla. The
departmental estimate of 'madak' smokers in
these districts in 1933 was 1,707, 868, 490 and
400 respectively. Raipur was worse even than
the notorious Narshingpur subdivision in which
the number was 1,500.

*Opium smoking in Burma**

It is not exactly known when opium was first
introduced into Burma. Cæsar Fredericks, a
Venetian, who travelled in the East for eighteen
years, described at some length in A.D. 1591 his
two ventures in importing opium into Burma
from Cambay and the port of Chawl on the
West Coast of India. F. C. Danvers of the
Dutch East Indies Company, in a memorandum
from the Hague, refers to the Company's trade
in opium in the year A.D. 1613. It is mentioned
that at that time 200 lb. of opium were
annually sold in the Malaccas and that the drug
was profitably sold in Siam and Pegu. Opium
was thus in use in Burma over three hundred
years ago.

In Burma, as in China, the smoking of an
extract of pure opium is of comparatively recent
origin. The annexation of Arracan by Bengal
after the first Burmese war led to an increased
consumption of opium by the Arracanese as the
regulation for the sale of opium in Bengal was
not at that time stringent. In the first Burmese
war, after the stockade at Kemmendine was
captured, a quantity of raw opium was dis-
covered. Even to-day by far the largest number
of consumers are to be found in Arracan.

In Burma besides the special opium pipe, pre-
pared opium is smoked in the form of what is
known as 'katpon'. It is made by mixing the
prepared opium with dried plantain-leaf torn
into shreds and dried over a fire, the opium
being thoroughly mixed with the leaf. This is
then smoked in an ordinary pipe.

On account of the large Chinese population,
the smoking of opium is very prevalent in

* When this survey was done Burma was a part of India.

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Burma. Among the Burman addicts, more eaters of opium than smokers have been registered. The import into Burma of opium prepared for smoking is prohibited, but its manufacture and use are allowed, subject to certain restrictions. In order to discourage smoking the manufacture and sale of prepared opium were discontinued in the licensed shops from the 1st April, 1921. Those who desire to smoke opium now have to prepare it themselves. In 1924 a law was made prohibiting any person other than a registered smoker from possessing prepared opium, and a register for opium smokers was opened for six months from 9th January, 1924. Up to 31st March, 1932, no new names could be added to the register and it was expected that with the gradual disappearance of the persons registered in 1924, opium smoking would cease to be permitted in Burma, except in a few of the backward tracts. In 1929 a Commission of Enquiry into the Control of Opium Smoking was appointed by the Council of the League of Nations which visited Burma and the countries in the Far East. This Commission condemned the system of a closed register on the ground that this did not lead to a suppression of the opium habit but drove the consumers to the use of illicit opium. This and other recommendations were examined by a small committee composed mainly of members of the Burma Legislative Council. The committee after due consideration recommended that the Government of Burma should adopt the ultimate suppression of opium consumption among all races in Burma as the goal of its policy and that in order to achieve this end the system of a closed register should be abolished. As a result of this recommendation the opium smokers' registers which had been closed since 1924 were thrown open with effect from the 1st April, 1932. The total number of registered smokers of opium by the end of 1933 was 20,678. About 67 per cent of these registered smokers were Chinese and Burmese, with only a very small proportion of Indians and others.

Since the reopening of the register of Burman opium addicts, both eaters and smokers are coming forward to get themselves registered. Of 43,623 lb. of opium consumed during the year 1932-33 approximately 26,587 lb. were consumed by registered smokers and 17,036 lb. by the eaters. The Government of Burma had under consideration a proposal to license smoking saloons with a view to providing reasonable facilities for smoking where such may be necessary and at the same time enabling the excise staff to take effective action against unlicensed saloons.

The present extent of opium smoking in Burma

There were 53,000 licensed opium eaters and smokers in Burma, out of a population of 14,667,146 in 1933. The number of illicit opium consumers is probably quite large in view of the fact that 6.15 per cent of the convict population[illegible] defect is seen can be ascertained, unlice[illegible] the stomach, due sumers. Licit and illicit [illegible] Often owing to aptly likened to 'two stream[illegible] is enlarged and day on the surface and the o[illegible]e base remain ground, both closely connected[illegible] more or less in the same gene[illegible] has been estimated that appr[illegible] cent of the non-European popu[illegible]f a duodenal consume opium in one form [illegible]ulcer niche or incidence of opium addiction run[illegible] population density and the opiu[illegible]erable value, thus it is more common in large [illegible] such as Rangoon and Mandalay an[illegible] either by districts. In the deltaic areas of [illegible]raction in Arracan, where two-thirds of the o[illegible]vn as a sumers in Burma reside, the drug is [illegible] in small doses as a prophylactic against [illegible]enum As regards the use of opium as a stimulan[illegible] practice of taking the drugs is old-standing, indulged in in moderation, and is believed [illegible] produce no injurious effects. Burman consumers are as a rule mostly eaters. In the year 1932-33 out of a total of 16,000 registered consumers only 4,000 were registered as smokers. With Chinamen it is different and out of a total of 13,813 registered consumers 12,720 were registered smokers. Recent figures (March 1936) show the number of registered smokers at 17,388, of which approximately 68 per cent are Chinese, 20 per cent Burman and 2 per cent Indian. This total does not include the whole province as the smokers in frontier districts are not registered. Whereas amongst the Chinese opium consumption is to be found in all grades of society, in the case of other nationalities it is practically entirely confined to the lower strata of society.

Opium consumption in Burma appears to be specially confined to the male sex, excepting perhaps in the Kachin hills and the Shan States where female addicts are not uncommon. This is indeed fortunate, as established addiction among women is notoriously difficult to cure.

Opium smoking in other parts of India

Madras Presidency.—Our enquiries show that opium smoking is still met with in the Agency Tracts of Ganjam, Vizagapatam and East Godaveri districts. In the city of Madras a few opium smoking dens are said to exist. The habit has, however, almost disappeared from the southern part of the presidency. The number of addicts cannot be more than five to six thousand in the whole of this province.

Bihar.—The habit of smoking 'madak' prevails to a certain extent in some districts but is usually confined to towns and important centres of trade. There were 5,979 individual registered smokers under the 'Bihar and Orissa Opium Smoking Act' up to 31st December, 1931, when the register was finally closed. There are probably 4,000 to 5,000 opium smokers in this province at the present time. 'Chandu' smoking is met with to a limited extent in certain urban areas in the districts of Shahabad,

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s met with are Saharanpur, Bulandshahr,
rh, Muttra, Agra, Bareilly, Farrukhabad,
wah, Cawnpore, Fatehpur, Allahabad,
enares and Gorakhpur. The Opium Smoking
Act of 1934 came into force on 1st August, 1935,
and provided for registration by habitual opium
smokers within a specified period. No person
below the age of 25 can get himself registered.
The period up to which registration was
possible expired on 31st December, 1936.
The approximate number of smokers in the whole
of the United Provinces, as reported by the
district officers, is 2,777. This figure is on the
low side as there is no information regarding the
unregistered smokers.

The Punjab.—The habit of smoking 'madak' and 'chandu' is met with to a limited extent in most of the district towns all over the province. It was possible to trace smokers in Lahore, Multan, Gujranwala, Jullunder, Rawalpindi, Ambala, Ferozepore, Ludhiana, Amritsar and Sialkot districts though in small numbers in each city. The probable estimate of the number of smokers for whole of the province is 800 and 900.

North-West Frontier Province.—'Chandu' is usually smoked here and the habit although not common is met with in towns like Peshawar, Kohat, Hotimardan, Dera Ismail Khan, and Bannu. The probable number of smokers in this province is not more than 500 to 1,000.

Ajmer Merwara.—A number of opium smoking dens existed in Ajmer town and the estimated number of smokers would probably not be more than 50, chiefly among the mendicant class.

Bengal Presidency.—Smoking of opium is common amongst the Chinese population in Calcutta and its suburbs and it is estimated that 40 per cent. of them smoke opium. The habit can also be traced amongst the labourers and mill hands in the suburbs of Calcutta. In smaller towns like Murshidabad, Dacca, and Mymensingh the number of smokers is negligible. The approximate number of smokers in the presidency would probably not be more than 6,000 to 7,000. The Tibetans, Assamese and Mughs in the districts of Darjeeling and Chittagong rarely smoke opium. The Opium Smoking Act and the rules made thereunder had the desired effect throughout the presidency and the number of smokers has gradually declined, but supplies of prepared opium are sometimes obtained from illicit sources. No prepared opium is allowed to be sold.

Bombay Presidency.—The habit of smoking both 'madak' and 'chandu' is common among the Chinese and Persian population in Bombay city itself and it is also encountered amongst the low-class Mohammedans and mendicants. In the town of Bombay alone there are about 500 opium smokers out of which 300 are Chinese and Persians. In the following towns in the presidency a few smokers probably exist but the habit is gradually dying out: Ahmedabad, Poona, Sholapur, Broach, Ahmednagar, Thana, Nasik and Surat. The approximate number of opium smokers in this presidency is between 900 and 1,000.

Sindh.—The practice of smoking opium is met with in Karachi like other large sea-port towns of India. There were a number of smoking dens in this town which were mostly frequented by low-class Mohammedans, Chinese and Persians. Smoking is practised on a small scale in towns like Hyderabad, Sukkur, Mirpur Khas, Shikarpur and Jacobabad. There are approximately 2,000 to 5,000 opium smokers in this province.

Opium smoking and hemp drugs.—From the survey we have made we have formed the impression that opium smoking has greatly declined throughout India during the last few decades and is even more rapidly declining during recent years; this decline is due to the stringent measures taken by the excise authorities against it. In some of the areas we have found that its place is being taken by the less expensive and perhaps also less injurious habit of smoking of hemp drugs.

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HYDATID DISEASE IN THE PUNJAB*

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THE object of this note is to draw attention to the relatively high incidence of hydatid disease in the south-western portion of the Punjab, a fact that has not been previously recognized. All the cases reported have come from a rural population of about 200,000 and they have all been seen in the last six years. The disease seems widespread throughout the area for at least one or two cases have come from practically every village in the district. It should also be noted that the records only include those patients who came to hospital, so it is probable the cases reported only represent a small proportion of the total number in the district. Another fact is that these observations were made at Rajanpur, which is only a small *tehsil* hospital, so that apart from the cases operated upon clinical findings only were available. It is therefore possible that other cases were missed that might have been found if more accurate methods of diagnosis had been available.

Case 1.—M., aged 30, male, sweeper. He noticed a small swelling eight years ago in the right hypochondrium. To this he paid no attention. It slowly grew bigger. During the last two months it had suddenly enlarged, with pain in the region, and he had fever. The lower half of the right side of chest in front and corresponding hypochondrium became œdematous, red, and tender; fluctuation present. He was emaciated, temperature 102°F., face flushed and moist, slight dry and painful cough, basal pleurisy. Operated on on 8th September, 1931, under chloroform; vertical incision two inches over the swelling which was found adherent to the parietal wall. Contents removed and cavity drained. Cavity occupied right lobe of liver. Contents consisted of very foul-smelling pus mixed with degenerating cyst wall and daughter cysts; progressed well; discharge dried up. Left the hospital against medical advice on 27th October and came back on 29th December, with infection in the cavity and lung abscess. Died on 2nd January, 1932, from exhaustion and toxæmia from abscess of the lung.

Case 2.—S., aged 20, female, housewife. She noticed a small swelling in the epigastrium a year ago. It slowly enlarged. This was movable up and down with respiration and was connected with the margin of the liver on left side; fluctuation present. Operated on under chloroform through paramedian incision. A cyst on the lower surface of the left lobe of the liver was found, and completely excised. Abdomen closed; recovery uninterrupted.

Case 3.—G. R., aged 35, male, agriculturist. He noticed swelling of abdomen some six years back, loss of appetite, occasional colic, not very severe. He was anæmic. Abdomen prominent, nodular, tense, seemed full of small swellings each about the size of a fist. Every one of them fluctuating. They were all movable. He was afraid of taking full meals on account of discomfort and tension induced. Some dry cough. Areas of dullness all over the chest on both sides. Operated on on 15th February, 1932, under chloroform to explore the condition in abdomen and relieve if possible its tension. Omental and mesenteric cysts were found, fifteen of which were removed. Liver and spleen were studded with similar cysts. Abdomen closed; quite well up to 8th March, when he died of rupture of cyst ing defect is seen evidenced by immediate urticaria the stomach, du

Case 4.—T., aged 40, female, h Often owing to a swelling in the right hypochon is enlarged and slightly painful, pain was incr connected with liver, globular abo e base remain head; fluctuation present. O chloroform through pararectal in localized on the under surface of Contents evacuated, consisted of cy cysts which were undergoing degen f a duodenal anchored to the anterior abdominal ulcer niche or She developed pneumonia after the o recovery was uninterrupted.

Case 5.—J., aged 56, female, beg erable value, a small swelling in the right upper some thirty years ago which had since occupies the whole of abdomen except either by fossa. Fluctuation is present, hydatid raction in In the upper part of the swelling an area vn as a is soft and at times reducible through a On straining and coughing the swelling recurs. operated on on 1st September, 1932; cyst was enum to the abdominal wall. At its centre there w opening which admitted the thumb, in the upper of the linea semilunaris, under the skin communicat with the cyst. This formed the hernia. The conten of the cyst were removed through the incision. Co tents consisted of 10 pints of cysts and daughter a grand-daughter cysts and fluid which were closely packed in the cavity. Cavity measured 12 inches diameter. Recovery uninterrupted except for a attack of pneumonia. Ventral hernia at the site o incision.

Note.—Only the left lobe of liver and small portion of right lobe could be made out after operation otherwise the whole liver was replaced by the cyst.

Case 6.—K. B., aged 30, male, agriculturist. H noticed a swelling in the right hypochondrium slowly growing bigger. There was no other complaint. For the last fifteen days he began to get fever and the swelling suddenly grew bigger and became painful. Pain constant and agonizing. Swelling occupying the right upper half of abdomen, tender, painful, and continuous with liver. Temperature 103°F. Operated on under chloroform on 23rd September, 1932. Cyst was found in the right lobe of the liver. Cyst wall was anchored to the abdominal wall. Cavity opened and drained. Contents consisted of very offensive pus and daughter cysts. Recovery uninterrupted.

Case 7.—C., aged 25, female, Mohammedan, agriculturist. She noticed a swelling two years ago in the middle of the forehead. This slowly enlarged to the size of a walnut. Skin healthy and movable over the cyst and cyst movable on the underlying tissues. Operated on on 12th February, 1933, under local anæsthesia and the cyst enucleated. Healed by primary union.

Case 8.—R., aged 27, male, Mohammedan. He noticed a painless swelling in the right hypochondrium four years ago. It gave him pain occasionally when he exerted himself. The swelling is continuous with the liver, movable with it and fluctuating. Operated on on 2nd March, 1933, under chloroform through a vertical incision over the cyst. The cyst wall was anchored to the abdominal wall and opened. The contents consisted of clear fluid with few growing daughter cysts. When shown to him after the operation he said that he coughed out similar material some two years back with some blood. Recovery uninterrupted.

Note.—He had had a lung cyst causing no symptoms which healed spontaneously by rupture and expectoration.

Case 9.—M., aged 30, male, Mohammedan, agriculturist. He noticed two swellings, one in the right hypochondrium and the other on the right side of the umbilicus, six years ago. Both grew bigger as time passed. The upper swelling was continuous with liver and was the size of a closed fist, fluctuation present. The lower cyst seemed in the abdominal wall; it was fixed, nodular and fluctuation was slight. Operated on on 2nd March, 1933, under chloroform. No.

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grafting and other recon ision over the cyst. Cyst was in
There are minimum sc anterior surface. No. 2 through a
saving of lives that wou the cyst. Cyst was found outside
behind the rectus sheath. No. 1
cyst, and no. 2 of numerous
covery uninterrupted.

Air Warfare and

By L. H. G ed 25, female, Mohammedan,
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If air war shou o not pay much attention to it. She
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tions for the y th of the epigastric and right umbilical
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(1) A puncture present, slightly tender, no fever.
air warfa ion nder chloroform through a vertical incision
aircraft ar, on st dependent part and the cyst contents
(2) A int cyst wall, daughter cysts and turbid fluid
stance, libri his cyst was exterior to the peritoneum.
on the s uninterrupted.
(3) A m 11.—I., aged 25, female, housewife. Growth in
pro right upper outer quadrant of right breast lobulated,
of fi d, fluctuating, painless, partly situated under the
th eola and partly outside it. Diagnosis of retention
cyst made and operated on under local anæsthesia.
Cyst removed and found to be a hydatid. Healed by
primary union.

Case 12.—T. B., aged 30, Hindu, male, shopkeeper. He noticed a swelling in the right upper part of abdomen about five or six years ago. Swelling was gradually increasing and getting more painful. Pain came in attacks lasting one or two days, then an interval of quiescence of several days. These painful attacks were getting more frequent and keeping him away from work. He also sometimes complained of pain in the right shoulder. Pain had no relation to meals. The swelling occupied the right hypochondrium and part of the epigastric region, it was continuous with the liver and movable with it, painful on pressure, fluctuation present. He was anæmic and had slight fever ranging from 90° to 100°F. for the last two months. Operated on under chloroform through a vertical incision over the swelling below the costal margin. Cyst was found in the right lobe of liver and was anchored to the abdominal wall. Contents consisting of cyst wall, degenerating daughter cysts and turbid fluid were removed. Progressed well except for occasional attacks of malaria.

He began to get pain in the abdomen six months after he had left the hospital. The pain was colicky in nature and came on two or three times a day. One day it was very severe but it suddenly ceased and he passed blood and some cysts similar to those seen at the operation. The pain did not reappear for some time afterwards. A month later he began to get fever and the previous wound became painful and swollen. He came back to the hospital. The scar was raised over a fluid swelling which was opened and pus drained out. The opening led into the cyst cavity. It was enlarged, washed and drained. He left the hospital about a month after.

Case 13.—M., aged 49, female, Mohammedan, housewife. She noticed a small swelling in the right hypochondriac region some eight or nine years ago which grew slowly. The swelling became painful a year ago. The pain gradually increased daily and was keeping her away from work. It was worse on exertion. The swelling was about the size of a cricket ball and continuous with the liver at the site of gall bladder. She was anæmic and was getting occasional attacks of fever. Spleen enlarged. No jaundice.

She was treated for malaria for a fortnight and then operated on on 28th August, 1933. A cyst was found on the under surface of the liver; the gall bladder was small and pushed to the left side, and was healthy. The cyst was anchored to the abdominal wall and opened. It was found that the cyst communicated through an inch-wide hole with another cyst behind. The contents of this cyst were also removed and drained. During the treatment she got several attacks of malaria which did not respond to quinine and she died of malarial cachexia about seven weeks after the operation.

Case 14.—S., aged 25, female, Mohammedan, housewife. She first noticed a swelling on right side of neck some six years ago. This very slowly enlarged and attained the size of a cricket ball. It was oval, painless and fluctuation was present, it was situated in the middle of anterior border of the trapezius. Operated on on 19th December, 1933, under local anæsthesia and cyst removed.

Case 15.—H., aged 27, Mohammedan, male, shepherd. He noticed a painless swelling two years ago in the right pectoral region which increased slowly till four months ago when it suddenly enlarged with pain and fever. A few days later the swelling burst into the right axilla and was discharging. When he came to hospital, the swelling subsided. The discharge lessened when the swelling reappeared and became painful and after a few days it again discharged spontaneously.

Present condition—the right pectoral region is slightly more swollen. Swelling marked close to the sternum opposite 2nd and 3rd costal cartilages and painful, slightly red. Three sinuses in the axilla are covered with unhealthy button-like granulations, leading upwards and medially. No bone necrosis found. Operated on on 25th February, 1934, under chloroform for suspected caries of rib. Sinuses enlarged and scraped. The medial swelling was opened but no caries was found. During dressing one day a few daughter cysts came out with the discharge. The track was followed up and a few more cysts were found under the pectoralis minor muscle. The cavity was scraped and wound dressed and the arm kept in an abducted position. The wound healed in three weeks and the patient was discharged.

Case 16.—H., aged 30, Hindu, female, housewife. She had a swelling about the size of a walnut, a little above the outer part of the left eyebrow, which started as a small nodule. The skin was movable over it, and it was fixed below. Operated on on 14th March, 1934, under local anæsthesia and cyst enucleated. The under surface of the cyst was eroding the bone. Recovery immediate.

Case 17.—M., aged 22, Hindu, female, housewife. She noticed a swelling in the epigastrium some four or five years ago which had gradually grown bigger. At present it is of the size of a cricket ball. Fluctuation is present and it seemed continuous with the liver. She was operated on under chloroform on 1st April, 1934, through a paramedian incision. The cyst was in the left lobe of the liver, it was anchored to the abdominal wall. Contents consisting of cyst wall and a few daughter cysts with clear fluid were removed and the cavity drained. Recovery uninterrupted.

Case 18.—B., aged 20, Mohammedan, female, housewife. She noticed a swelling a year back in the left lumbar region close to the crest of the ilium. It was hard and increased slowly in size. Two months before coming to the hospital the swelling became more painful, attained a bigger size and grew softer. She had some fever, swelling occupied the left lumbar region from the iliac crest to the last rib. Bending was difficult and movements of the back limited. Local tenderness and slight œdema present. It was thought to be a case of caries of the ilium and operation was performed under chloroform and the swelling was found to consist of pus and degenerating cyst wall. It was removed and the cavity scraped and drained. The cyst was under cover of the latissimus dorsi, close to its origin from the ilium. She left the hospital cured.

Case 19.—A. B., aged 35, Mohammedan, male, agriculturist. He had a swelling about the size of the head on the left side of the neck posteriorly. He stated that it began as a small swelling, the movements of the neck were limited and he kept his head always drawn upwards and forward. Fluctuation was present and the tumour seemed fixed so lipoma was thought of. Opened under chloroform, a single cyst was found under cover of the subsplenius capitis muscle. The contents were evacuated and the cavity drained. Left the hospital cured.

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Case 20.—G. H., aged 22, male, Mohammedan, bricklayer. At the age of 12, he had an attack of painful micturition. Suspecting a stone in the bladder (a common disease in the area), he consulted a doctor who passed a sound with negative result. The sounding was very painful and frightened him very much. Since then he had been getting occasional similar attacks but he never consulted a doctor being afraid of the small operation. During this time he had occasional attacks of retention of urine. This he learnt to relieve by applying cool mud over the hypogastrium. When he was twenty he noticed a small swelling above the pubis. He took it to be a full bladder as it disappeared after he had passed urine. The swelling always appeared whenever he got an attack of retention. These attacks became more frequent and the swelling began to persist and to grow upwards slowly. Six months ago all the symptoms grew worse. In spite of this he did not then consult a doctor. He had not passed any urine for the last four days before he was brought to the hospital. There was a swelling in lower part of abdomen reaching the level of the umbilicus. It was globular, hard and tender on pressure, fluctuation present; pressure caused a little urine to flow. Rectal examination revealed a globular swelling filling the whole pelvis. Its upper margin could not be reached. The lower margin was about an inch and a half from the anal margin. No definite diagnosis was made. A catheter could not be passed. A provisional diagnosis of full bladder was made. He was prepared for immediate operation. The usual incision for opening the bladder was made and it was found that the bladder was stretched in front of a cystic swelling and was empty. The bladder which had been opened was closed again and the incision was prolonged upward and a cyst attached to the upper and posterior surface of the bladder was found. This was opened and its contents removed and drained through the upper part of the incision. The lower part of the wound was completely closed and a catheter was left in the bladder. The patient passed large quantities of urine through the catheter after operation (probably from a hydro-ureter and hydronephrosis). For 24 hours after operation his condition was quite satisfactory, but then he suddenly collapsed, and died the same evening from shock.

Case 21.—M., aged 30, Mohammedan, male, agriculturist. He noticed a swelling over the left parietal bone two years ago. This grew slowly to about the size of a hen's egg. Fluctuation was present, and it was freely movable. Operated on under local anæsthesia, the cyst was enucleated. It was a typical single hydatid cyst. Healed by first intention.

Case 22.—K. B., aged 45, Mohammedan, male, weaver. He noticed a swelling in the abdomen some thirty years ago, immediately above the umbilicus. About the age of thirty it had grown to the size of a child's head and he got it tapped. It again filled up and five years later he had the same treatment. This time it enlarged more and became painful. As he did not find relief after these two tappings he abandoned the idea of further treatment. All this time he had been doing his work quite well. During the last two years he noticed that he was growing weak and losing flesh. This brought him to the hospital. On examination the swelling was found to occupy the middle of the abdomen, three-quarters of it above and one-quarter below the navel. The skin was black and hard from constant friction with his tools and instruments. The swelling was very hard and seemed heavy. With great pressure a depression could be made in it and the depression persisted. A provisional diagnosis of calcified cyst in the abdominal wall was made. Next day he was operated on through a paramedian incision. The cyst wall was very hard to cut and an opening about two inches long was made into it with great difficulty. The wall was all calcified and the contents resembled brown plasticine mixed with degenerated daughter cysts, red in colour. They were removed with a spoon aided by lavage. The cyst was drained but the cavity did not collapse. Calcareous flakes began to separate on the fifth day and all the calcified material had been evacuated by the fifteenth day. The cavity granulated well and collapsed but big defect is seen diarrhœa from which he died o the stomach, due after operation. Often owing to

Case 23.—N., aged 50, Hindu, is enlarged and She developed a small swelling s ago in right upper part of abd e base remain bladder is located. She used to resembling biliary colic at interva pain got very frequent and at last She had a small swelling in the ri situated close to the ninth costal f a duodenal movable with the liver and tende ulcer niche or was present. She had lost weight and poor. Temperature was from 99°F. t erable value, exaggerated with meals. All article produce flatulence gave her trouble. cholelithiasis was made and operation either by removal of gall bladder. On opening raction in through the usual incision, it was found bladder was pushed to the left and was vn as a and normal. In its place a cyst about the closed fist was located in the right lobe of ileum wall was partially calcified. It was anchored abdominal wall and opened, and the contents cons of white fluid with daughter cysts were removed. progressed well and after a fortnight a cast of the cy partially calcified came out through the wound, afte which it healed rapidly. The pain disappeared and she regained her health quickly.

Case 24.—B., aged 22, Mohammedan, female, housewife. She noticed a swelling in the epigastr some four years ago which was slowly enlarging. S got married a year ago, and sought medical advice, b she did not agree to an operation. She had a ch two months ago and after this the swelling beca painful. The pain was colicky in nature and had relation with food. It brought her to the hospital. T swelling was situated in the epigastrium and le hypochondriac region. It was dull on percussion excep on its lower part and it seemed continuous with the liver in its upper part. Mobility was not marked and fluctuation was present. The swelling was exposed through a paramedian incision. It had no connection with the liver, the stomach was pushed down to the left and the cyst was found coming from the posterior abdominal wall from the site of the pancreas between the liver and stomach. The cyst was anchored to the abdominal wall and opened, the contents consisting of single cyst containing clear fluid was removed and the cavity drained. Recovery was uninterrupted except for skin excoriation, which persisted for about a month.

Case 25.—A. B., aged 30, Mohammedan, male, washerman. He felt pain some seven months ago between his shoulder blades. There was little swelling at that time. It slowly enlarged and two months ago the enlargement suddenly increased and kept him away from further work as it was very painful. The swelling extended from the root of the neck to the 8th rib on the right side with the shoulder blade raised over it. The movements of the arm caused pain. The skin was slightly red. Fluctuation was present and the swelling seemed lobulated. A provisional diagnosis of lipoma or cold abscess was made. Through a vertical incision it was found to be an exogenous cyst lying under the trapezius muscle. It was drained and the cavity healed uninterruptedly.

Case 26.—M., aged 50, Mohammedan, male, agriculturist. He noticed a swelling some 25 or 30 years ago in the right upper part of the abdomen. This did not give him any trouble till six months ago when it got painful. There was rigidity of the upper part of the abdomen over the swelling; fluctuation could not be made out on account of extreme tenderness. Diagnosis of cyst adherent to the abdominal wall was made and operation performed. Incision was made over the most prominent part of the swelling which was adherent to the abdominal wall. While separating the adhesions some pus came out which was removed and the cyst opened. Cyst was partially calcified and contained a white solid mass which was washed out with difficulty and the cavity drained. Recovery uninterrupted.

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Air Warfare and

By L. H. G

(From the *Practitio*

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c Hindus, 22 Mohammedans and 1 Sikh, so that
race has apparently no bearing on the incidence
of the disease. Sex also shows no significant
differences for there were 15 males and 12
females.

Age.—The question of age incidence is very difficult to ascertain in this area. There is hardly a man who knows his age, even approximately. A young man of 30 asked his age will often reply that his age is 4 or 5 years. So that the ages are not exact but only approximate and judged from the appearance of the patients. Roughly, it is a disease which comes under notice generally after the age of 20 up to old age. The disease is probably acquired in childhood or adolescence, but the latent period is uncertain.

Occupation and financial position.—The disease is of the poor in both races. The occupation among Muslims is generally agriculture. The cases include a beggar, a bricklayer, a washerman and a sweeper. The agriculturist invariably maintains a dog to keep watch over his animals at night, as cattle-lifting is very common. The Hindus are better off financially and have not to keep dogs but they are generally fond of dogs.

Drinking water.—The area is generally sandy. The wells are few and are shallow surface wells, and the water being brackish is only used in times of emergency. The area is supplied by irrigation canals and small channels, and the areas close to the hills by hill torrents, both of which run in summer only. About one-third of the population lives by the side of rivers from which they obtain all their water. They store water in open *kacha* ponds which serve their purpose at times of scarcity. These places are used by men and all other animals, and one is impressed by the amount of excreta of all kinds lying by the side of these ponds, a fruitful source of all kinds of bowel infections. Water stored in *kacha* pots (*gharas*) is not even looked after properly. I myself have seen on numerous occasions in hot weather a dog lying next to such a pot and cooling his body by contact with the pot and the wet surface below.

Habits.—The people own large tracts of land —some situated at the foot of mountains irrigated by hill torrents and others close to rivers. Wherever they find suitable surroundings they move to that place. At such places they live in the open fields or in temporary straw huts. Under these insecure conditions they have to keep dogs. So these animals are in intimate association with man at all times.

Dogs.—The number of pariah dogs in a village is very great. For example, Rajanpur, where the dispensary is situated, had over 400 dogs with a population of 3,900. Here I was called upon to destroy those dogs at certain seasons. All those killed were subjected to a post-mortem examination for the presence of echinococcus. The total number examined was 156 with the following results :—

Number of dogs in which one or other worm was found	87
Echinococcus granulosus	45
Tænia hytadigenea	29
Toxascaris limbata	22
Opisthorchis caninus	14
Dipylidium caninum	6

The number of echinococcus varied from a few to many thousands in different stages of maturity. In one case the strained specimen of stools resembled a thin sago pudding measuring 4 ounces consisting solely of those worms. Wild animals are in great number in the area, especially jackals and foxes. They are known to harbour these infections but no work has been done locally on these animals.

Cattle.—As a municipal medical officer I carried out the meat inspection for the municipality. I availed myself of this opportunity to estimate the hydatid infection in different animals.

Among sheep and goats in this area it is 1 per cent. Whereas among cows and bullocks 150 out of 168 examined were found to be infected. In 118 the liver was the seat of infection; 88 also showed the disease in the lungs and the next most commonly infected organ was the spleen in 68. The cysts varied in size from a mere speck to the size of a child's head and multiplicity was the rule. These were usually endogenous but sometimes exogenous, especially in the lung under the pleuræ.

Disposal of offal.—No special care is used to dispose of this infected material and it is eaten by numerous dogs that visit these places daily. The infection in these dogs was particularly high.

In small villages cattle are killed for meat occasionally and the same disregard of offal disposal exists there.

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A BACTERIOLOGICAL STUDY OF CURDLED MILK (*DAHI*)

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CURDLED milk or milk fermented by the action of certain bacteria has been used for many centuries in different parts of the world. The *yoghurt* of the Balkans, the *busa* of Turkestan, the *kefir* and the *koumiss* of Russia and the *lebum* of Egypt are examples of curdled milk. These milk products are of great dietetic value and have been regarded as miraculous remedies for many ills. The fact that so many races make soured milk and use it copiously is by itself an excellent testimony to its usefulness. It was, however, largely owing to Metchnikoff that a great impetus was given to the multiplication of laboratory preparations containing cultures of lactobacilli. According to Metchnikoff, lactobacilli inhibit the growth of intestinal putrefactive organisms and thus prevent digestive troubles, rheumatism and generally prolong life. Considering the claims which were made on its behalf it is no wonder that lactobacillus milk came into demand in all civilized countries and people ate not only curdled milk but swallowed lactobacilli tablets which frequently contained no viable bacilli.

In India curdled milk (*dahi*) or one of its preparations has been used from time immemorial. In the earliest days of medicine, centuries before the Christian era, the great physician Sushruta drew attention to the great value of curdled milk and described in detail several different methods of preparation with their respective properties. The curdled milk is usually prepared by boiling the milk, cooling it to about 40°C. and then inoculating it with a small amount of curdled milk which contains the group of organisms known to yield a suitable product. Sometimes the milk is concentrated before inoculation, in which case the product is more nutritious but less refreshing than that prepared from unconcentrated milk. Often the curdled milk is diluted with water, churned and taken as a drink. There are two main types of curdled milk, the sweet and the sour varieties. The consistency defect is seen depend on a number of fac the stomach, dur portant of which are the sug Often owing to of bacteria contained in the is enlarged and taken and temperature at he base remain allowed to coagulate. The generally prepared is semi-sc finely-divided smooth curd wh readily digested even by those f a duodenal or-less intolerance for ordinary ulcer niche or moving the upper creamy layer variable amount of clear whey-lierable value, interesting to note that the addi agar to milk prior to the introdu either by starter results in the production o action in and richer looking product and we arvn as a that this is actually done in the pr of certain commercial products. enum

The present investigation

Bacteriological examination.—In order determine the bacterial content of curdled milk 24 samples were collected from different sources. Smears were made from a well-mixed portion of each sample and were examined for the relative number and the type of organisms present. One gramme of each sample of curdled milk was diluted with saline to make a dilution of 1 in 10. From this, further dilutions were prepared and 0.25 c.cm. of 1 in a million, 1 in ten million and in a hundred million dilutions were added to tomato-juice agar (40 per cent fresh tomato-juice in 1.2 per cent nutrient agar at a pH of 6.0). These dilutions were found to give isolated colonies of lactobacilli. The plates were incubated for 48 hours at 37°C. in reduced oxygen tension with an addition of 10 per cent carbon dioxide. Representative colonies were studied from each plate.

The identity of the bacilli.—Lactobacilli resembling in their main characteristics the *Lactobacillus acidophilus* were isolated from each of the 24 samples. Streptococci were isolated from 23 of the 24 samples. The streptococci were of the *Streptococcus lactis* group. In the five samples of sweet curds examined yeast cells were present in addition to the lactobacilli and streptococci. Gram-positive spore-forming ærobic bacilli were found in only three samples. These bacilli were of a heterogeneous group and as many opportunities exist for contamination these strains were not further studied.

Although each sample of curdled milk was inoculated on a variety of media and incubated under different atmospheric conditions no other type of bacteria was isolated from any of the samples.

Morphology.—In smears prepared from curdled milk the lactobacilli were easily recognized as Gram-positive long bacilli with parallel sides and somewhat truncated ends. Filamentous forms which occur in laboratory cultures were not seen in smears made from the curds. Bacillary forms 3-4μ in length, arranged singly or in pairs, in chains or in palisades, or long

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(*Continued from previous page*)

Animals dying of various diseases are thrown away in close vicinity to the village where dogs have free access to them.

[*Note.*—This paper is of great interest for it indicates a state of affairs that is probably by no means exceptional in many rural parts of India, and supports an opinion we have held for a long time, namely, that serious helminthic diseases are far commoner in India than the published records show.—EDITOR, *I. M. G.*]

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There are minimum sc solid media. Some bacilli
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Air Warfare and

By L. H. G

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inte 1 per cent glucose broth, and in the
medium there was a reduction of pH from
in 24 hours. Tomato-juice agar or whey
was found to be satisfactory for the isola-
lon of lactobacilli.

On tomato-juice agar or whey agar lacto-bacilli grew as isolated colonies, irrespective of the amount of inoculum. After 24 hours at 37°C. the colonies were small, about 0.5 mm. in diameter. They were raised, opaque, somewhat greyish in colour, rounded with an irregular edge, granular in appearance, pasty in consistency and with a glistening surface. After a week some of the colonies attained a diameter of 3-4 mm. and differentiation occurred into a thicker raised knob-like centre and a thinner periphery with a clearer intermediate zone. All the strains were rough and could not be suspended in normal saline or water.

All the strains of lactobacilli grew best in reduced oxygen tension with the addition of 10 per cent carbon dioxide. After repeated subculture in the laboratory feeble growth was obtained both under ærobic and anærobic conditions. The optimum growth was at pH 5-6. In nutrient agar or broth of pH 5-6 growth was readily obtained. The majority of the strains failed to grow in media with pH above 7. The optimum temperature for growth was 37°C.: slight growth occurred at 16°C. to 22°C. The biochemical reactions of 15 strains of the lactobacilli were studied. All strains fermented glucose, whilst approximately 50 per cent of the strains fermented lactose, 70 per cent fermented saccharose and maltose, 20 per cent fermented mannitol and 10 per cent fermented salicin. Indole was not produced by any strain. Milk was clotted by all strains usually after 48 hours, in four strains after 72 hours. In only two strains was milk clotted within 24 hours. The strains were compared with type strains of *L. acidophilus* and *L. bulgaricus* and the majority of the strains isolated resembled *L. acidophilus*.

Other organisms present.—Streptococci were isolated from 23 of the 24 samples examined. Gram-positive cocci arranged in groups of two or in short chains were seen in films made from curdled milk. They grew readily on nutrient agar both under ærobic and anærobic conditions. Surface colonies were of two types, (*a*) round, convex, opaque with a smooth and glistening surface and (*b*) opaque and granular often encircled by a thick annular ring. The deep colonies were lenticular, opaque with a uniform border. The majority of the strains fermented lactose, glucose, maltose, mannitol, salicin and saccharose with the production of acid only. Acid and clot were produced in litmus milk within 18 hours and the clot was firm in consistency.

Two types of yeast cells were isolated: type A was found in three of the five samples of sweet curds examined and type B was present in all the five samples. Colonies were isolated on tomato agar and attained a size of 1 to 2 mm. in 24 hours. The colonies of type A, on tomato-juice agar, were light grey in colour, round, convex with a series of concentric rings on the surface. These fermented glucose with the production of acid and gas and failed to ferment lactose, maltose, mannitol, dulcite, saccharose and salicin. There was no change in litmus milk. The colony of type B grown on tomato-juice agar was round, smooth and white in colour, and after incubation for four days there were projecting feathery outgrowths from the periphery of the colony. This type fermented glucose, maltose, mannitol, saccharose and salicin and did not ferment lactose and dulcite. Litmus milk was turned alkaline.

Storage.—The various samples of curdled milk contained from 200 to 1,000 million viable lactobacilli per c.cm. on the day the samples were obtained. When stored at ordinary room temperature (about 35°C.), there was at first a slight increase in the number of lactobacilli but within 24 hours the number of viable lactobacilli had become negligible and many of the samples were grossly contaminated, markedly acid and unpleasant to taste. The spoilage was due to spore-forming bacilli and fungi. Samples kept at a temperature approximately 16°C. to 18°C. and in a refrigerator (about 5°C.) remained unspoilt and pleasant to taste for periods varying up to 9 days. Within 24 hours there was a reduction by about 50 per cent in the number of viable lactobacilli. The viable count of lactobacilli in samples kept for 9 days at 16°C. to 18°C. and at refrigerator temperature was approximately the same; there was a reduction by about 75 per cent in the number of viable lactobacilli. Although Rettger (1935) regards a temperature range of 16°C. to 20°C. as the most favourable for storage of curdled milk and considers that comparatively low temperatures (5°C. to 15°C.) are unsuitable, in that it reduces the viability of the lactobacilli, our experience has shown that there is no appreciable difference in the viable count of lactobacilli in the samples maintained at 16°C. to 18°C. and at refrigerator temperature.

(*Continued at foot of next page*)

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ARTERIOGRAPHY

By R. DEMEL, M.D.

Professor of Surgery and Director of the Surgical Department, Krankenanstalt Rudolfsstiftung, Vienna

IN my present paper I wish to consider certain disease processes which have increased in number in the past few years, not only among hospital patients, but also in general practice. The processes in question are due to pathological changes in the blood vessels of the limbs.

(*Continued from previous page*)

Results of administration.—Curdled milk prepared with standard strains of *L. acidophilus*, *L. bulgaricus* and local strains was given to different individuals. Approximately 24 ounces of curdled milk were consumed daily by each subject for a period of six weeks. During this period lactose was given freely. The lactobacilli which were recovered from the stools could not be identified with the lactobacilli administered and there appeared to be no marked increase in the number of lactobacilli in the stools.

On the assumption that an intestinal strain of lactobacillus which has been recently isolated should adapt itself to intestinal environment more rapidly and more completely than one that has been propagated on artificial media in the laboratory, five individuals were given large daily doses of curdled milk prepared with freshly-isolated intestinal strains of lactobacilli. Although there was an increase in the number of Gram-positive rods in fæcal smears there was no marked alteration in the intestinal flora and the lactobacilli isolated could not be identified with the strains administered.

Summary.—Twenty-four samples of curdled milk collected from different sources in Calcutta were examined for their bacterial count.

Lactobacilli resembling in their main characteristics the *L. acidophilus* were isolated from each of the samples.

Streptococci resembling *Streptococcus lactis* were isolated from 23 of the 24 samples.

Yeast cells were present in the five samples of sweet curdled milk examined and were absent from the sour variety of curdled milk.

Curdled milks prepared with standard strains of *L. acidophilus*, freshly isolated strains from a number of commercial curdled milks and from human intestines were administered to different subjects along with adequate amount of lactose. The organisms isolated from the stools could not be identified with the bacilli administered. There was no evidence that implantation of lactobacilli had occurred in the intestine.

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The patients are chiefly ng defect is seen young age otherwise fit for the stomach, duo pitiable, not only because o Often owing to pain they suffer, but also bec is enlarged and ment may bring so little relie e base remain eventually becomes the only It was to prevent such drast the present investigation w Before it, we had already emp f a duodenal years the customary modes of lcer niche or as subcutaneous and intravenou sodium nitrite, papaverin, callicre erable value, bine, the local application of heat, tion of the appropriate spinal cord either by the diseased limb by *x*-rays. Nonaction in methods of treatment was successfyn as a arterial sympathectomy and sympathic theresis done by Doppler's method also enum We therefore next turned our attentio arteriography in the hope that *x*-ray pictures blood vessels would lead to advances in th diagnosis of vascular disease in the limbs.

Arteriography

Frank and Alvens were the first to demonstrate blood vessels in the living animal. They injected a bismuth-ether-oil solution into the circulation of dogs, and observed by the *x*-ray screen the oil drops as they were carried by the blood. Later, in 1923, Berberisch and Hirsch used opaque fluids and obtained *x*-ray demonstrations of blood vessels in man. Their example was followed by others in America, Portugal and France using concentrated halogen-salt solutions.

In 1929, in co-operation with Sgalitzer and Kollert, I chose uroselectan to show up the arteries. This drug was already known to us through the reports of Lichtenberg and Swick. It has been used by intravenous injections to obtain *x*-ray pictures of the urinary organs (intravenous urography). In more than 100 cases uroselectan was tolerated without any ill effects, although urography demanded a multiple of the amount required for arteriography. Generally speaking, 20 c.cm. of uroselectan sufficed for arteriography, but if these were not enough another 20 c.cm. were injected. We gave up the use of uroselectan, however, because the instability of its solutions made it necessary for fresh ones to be made before each operation. In consequence we turned to abrodil in 20 per cent solution. This is stable, and we have now used it for many years.

Technique of arteriography

The artery is first exposed under local anæsthesia. The strictest aseptic precautions are required because of the defective blood circulation in these patients. When the disease process is in the leg the femoral artery is exposed below Poupart's ligament. When the disease is in the arm the axillary artery is exposed just enough to permit an injection being made into it. There is no removal of the adventitia as is the

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Air Warfare and

By L. H. G

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The patient is subsequently kept in bed for six days. The stitches are then taken out and he is allowed to get up. The operation is generally painless, but sometimes a spasmodic pain may be felt at the end of the injection. This pain disappears in about 10 seconds.

Diagnostic value of arteriography

Arteriography can be expected to show which of the vascular areas of a limb is most affected by the disease processes, and to throw light on the type of the primary disease together with the extent of the impairment of the circulation. Further arteriography, by giving the exact localization of an embolus, facilitates subsequent operative treatment. The site and shape of an aneurism are also revealed, and the knowledge thus obtained usefully guides subsequent operative procedure. Moreover, we can obtain characteristic pictures of narrowed lumina and occlusion of vessels in such conditions as thrombus, spasm, arteriosclerosis and endarteritis obliterans. If arteriosclerosis involves a stenosis we may obtain a differential diagnosis between involvement of the intima or media. Smooth and trough-shaped narrowings in the pictures of the liquid in the vessels indicate a thickening of the media, while jagged projecting shadows indicate proliferation of the intima. We have further learnt that vessels with abrupt curves and narrow sinuosities are pathological, for sinuous lines imply arterial obstruction even though the lumen of the vessel seems normal.

Arteriography also reveals the collateral circulation in cases of complete obstruction, and the degree of development of such collaterals enables the recent to be differentiated from the long-standing occlusion. We may thus become aware of the existence of favourable circulatory adjustments in cases of complete and long-standing intermittence of a main vessel.

sympathectomy, and there exposure. It is necessary y because of the frequent in the vessels, and because f error arising from percu-

on-wool placed round the assistant to hold the vessel for the injection. The needle too fine, and should be pulled the injection is over. The site then covered for a short time stick which has been dipped into n. This quickly stops any

to the operation a case wrapped in a and containing the *x*-ray plate under the operation-limb. The *x*-ray a portable apparatus is also so arranged the exposure can be performed when the geon requires it. This is towards the end of injection. The wound is closed after the

In contrast with this we cannot deduce good nutrition of a tissue from the filling of its arteries, an error we made when we first started our work. It is much more important to consider the changes of the vascular walls that are revealed by the fillings (defects in the vascular wall, tortuous vessels, etc.). Such are the changes to be considered when assessing the state of nutrition in their area. Increasing experience so enabled us to understand the significance of these changes in the vascular walls that we were eventually able to determine the correct level of amputation before an operation for gangrene.

Uniform strictures in the fluid picture and smooth border lines in the narrowed area indicate spasm. In these cases we have found out why gangrene does not occur even though large sections of blood vessel are empty. The cause lies in the transient character of the spasm.

Stenosis caused by spasm may simulate any other stenosis. To differentiate spasm from an organic stenosis, 0.06 gm. of papaverin or eupaverin (Denk) is injected subcutaneously. Ten minutes later intra-arterial injection and *x*-ray exposure are repeated. Any defects of the vessel wall or strictures seen in the second *x*-ray plate are due to organic disease of the vascular wall because spasm is abolished by papaverin.

The therapeutic effect of arteriography

In the early days of our work on arteriography, an important case came under my observation. An Italian officer, aged 37, had an upper left arm amputation. Two years later the type of trouble which had demanded this amputation occurred in the right hand also. The patient suffered much and required large doses of morphia to alleviate his pain. When first seen by me there was no pulsation palpable in the right forearm, the fingers were cyanotic and swollen, and they could be moved only with great effort.

A diagnostic arteriography was done, and revealed only slight fillings of the ulnar and interosseal arteries. The radial artery and the vessels of the hand were imperceptible.

But, to our astonishment, subsequent to the arteriography the patient was so relieved of his pains that he no longer required morphia. In addition, the changes in the hand regressed; and his arm was saved. This improvement has persisted for over six years, and the patient now uses his arm without difficulty.

This was the first case that demonstrated a therapeutic influence of arteriography. After that striking case I paid special attention to this therapeutic action. Experience has shown me what now follows.

Patients with thrombo-angiitis obliterans (Burger), endarteritis obliterans, peripheral arteriosclerosis with angiospasm who, previous to arteriography, had suffered intense pains requiring large doses of narcotics did not need them after. The diseased limb lost its cold and

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pallid appearance, and grew warm. I also observed that bedridden patients and those barely able to walk a hundred metres, because of pains and spasms, could move and work without trouble after arteriography had been done. The capillary microscope demonstrated that these clinical improvements were accompanied by a re-establishment of normal conditions in the capillaries. The capillary loops were distinctly seen and the blood circulated properly in them.

Some time after we had made our observations, J. Schüller in 1933 also observed a valuable therapeutic influence of arteriography. My own observations extend over many years and have been made on 70 patients. I therefore feel justly entitled to emphasize the therapeutic influence of arteriography.

It should be clearly understood that all our patients had previously been treated elsewhere by the usual methods. They had been treated internally, and physically with radio short waves and *x*-ray irradiation. Some of the patients had undergone Leriche's operation, others had been brushed with phenol in accordance with Doppler's technique. None of these treatments was successful, and the suggestion of amputation at the upper thigh was actually the cause which led some of the patients to my consulting room.

In the cases considered above we were not dealing with functional disturbances of limbs due to spasms and pains; coldness, lividity and bluish discoloration, and even sometimes circumscribed gangrene indicated distinct circulatory changes. We did not deal with incipient vascular disease, but with definitely established pathological changes of advanced nature. In the arteriographic pictures of the fluid in the vessels the defects generally manifest were several centimetres long. The most frequent sites of serious change were the central portion of the femoral artery and that portion of the femoral artery which lies about a hand's breadth above the knee joint, just in the adductor canal.

Quite apart from relief of pain and the vanishing of pallor, I observed also a curative action on the skin, even in cases of long-standing loss of tissue. Thus, it sometimes happened that a line of demarcation was established in a gangrenous toe. The toe then fell off, or was removed by operation. Afterwards the wounds healed up.

But I must also mention that these remarkable changes in the clinical picture were rarely accompanied by changes in the palpability of the affected arteries. If we could not trace an artery by palpation previous to arteriography, we could not do so after, although the other conditions were better.

Prof. Pick, at the suggestion of Sgalitzer and myself, experimented on animals in the Pharmacological Institute with the idea of obtaining an explanation of the therapeutic influence of arteriography. He found that arteriography with abrodil and perabrodil ...ng defect is seen ...sisting and distinct dilatatio...the stomach, due... branches. Often owing to ... is enlarged and ...

It must further be empl...e base remain ... graphy can be repeated at ... site. A second arteriograph... the first. These second artel... a better development of the c...f a duodenal ... corresponding with the durat...ulcer niche or ... These collaterals bridged ov... portion of the main artery, and ...erable value, importance for the maintenance ... tion.

The unfortunate admission has ...either by ...action in however, that arteriography is not ...vn as a therapeutic success; actually, only ... the patients obtain benefit therefrom. ...enum... I yet accurately foretell whether a pa... patient will benefit or not. Benefit is r... ably certain in cases of angiospasm, and a... all in cases of endarteritis and thromb... obliterans.

At the same time it is to be observed that arteriography has spared many of my patients from amputation. When the arteriography was performed, not only was amputation deemed urgent, but there was also no hope either for relief of pain or of any restoration of working capacity.

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A Mirror of Hospital Practice

AN UNUSUAL CASE OF MULTIPLE STONES IN THE URETER

By K. S. THAKUR, M.R.C.S. (Eng.), L.R.C.P. (Lond.), D.T.M. & H. (Camb.)

LIEUTENANT-COLONEL, I.M.S.

Surgeon-Superintendent, Shambhunath Pundit Hospital, Calcutta

MOHAN SINGH, an ex-sepoy, who had seen service... France was admitted to my wards on 13th Novembe... 1936. He complained of a swelling in the right hyp... chondrium and on the right side of the epigastrium. ... investigation, it was found that the patient had a ...

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Air Warfare and

By L. H. G

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the left kidney and had a few in right ureter with the right kidney and probably hydro-pyonephrotic. left kidney was found to be not d. I therefore decided first to ide.

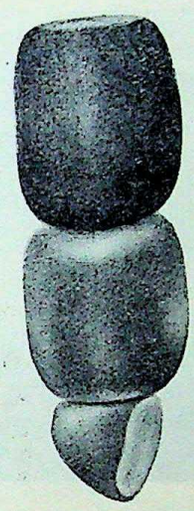
1937, I made a long lumbar incision order to get a good view of the the renal pelvis. After incising posterior wall of the pelvis of the th irregular stone weighing one ounce considerable difficulty, as part of hemly embedded in kidney tissue. After alyse itches to close the incision in the renal thod was partially closed and a drain left viz, und. There was a fistula for a time but wound closed up completely.

(1) A ductua skiagrams on different occasions, the posi- ion a on the right side at the lower end of es, on was found to be constant. I therefore (2) is inte make a para-rectal incision and reach the extra-peritoneally. The uppermost stone was (3) located and was found to be movable in a dilated

The pathological curator of the Royal College of Surgeons of England to whom I sent a report of the case has kindly sent me the following comments :—

'1. From their colour and facets, the stones appear to be urate and uric acid.
2. Since ureteric stones always originate in the kidney, the presence of unopposed facets would suggest a fairly long stay in the renal pelvis before descent into the ureter.
3. It is remarkable that the renal function on the left side was so little impaired in view of the almost complete obstruction of the ureter, more especially as it is probable that the right kidney would never recover its function after gross and prolonged infection.

CALCULI WITH WEIGHTS AND MEASUREMENTS



13.3 grm.
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10.2 grm.
2.2 × 2.2 cm.

2 grm.
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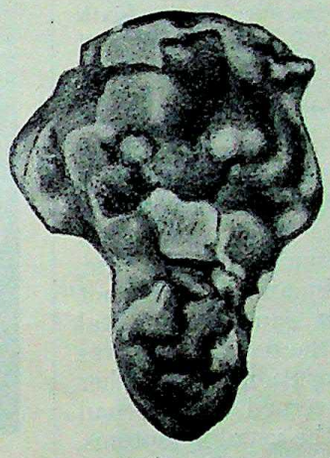
Right ureteral.



25.8 grm.
5 × 3½ × 2½ cm.

Left renal.

portion of the ureter. After incising the ureter longitudinally this was easily removed. A large quantity of thick whitish fluid gushed out of the wound. When all the fluid had drained away I located two more stones in the right ureter near its entrance into the bladder. These were absolutely fixed and could not be moved. With the help of an assistant's finger in the rectum to steady them, I incised the ureter lower down over them and with great difficulty succeeded in dislodging and removing them.

After the second operation the patient's condition was low for some time, but ultimately he recovered completely and was discharged cured from the hospital on 30th June, 1937.

It may be noted here that, before his discharge, his urine was clear and the swelling on the right side had gone down completely.

A point of interest to be noted is that the uppermost stone has two facets, one on the superior and another on the inferior surface. Similarly the lowermost one has two facets. This phenomenon is probably associated with the movements of the stones in the early stage of their formation, as otherwise in the absence of stones above and below it is hard to account for the facets being present on the superior surface of the uppermost stone and inferior surface of the lowermost.

Bilateral renal calculi are not uncommon in this country but I do not remember seeing a case in which all the stones on one side had passed into the ureter, and I feel sure that a published record of the case would be of interest to your colleagues'.

PERFORATION OF THE ILEUM IN SUSPECTED AMBULATORY TYPHOID TREATED WITH ESTABLISHMENT OF DRAINAGE AND FŒCAL FISTULA AND SUBSEQUENT ENTERECTOMY

By S. R. GORE, L.M. & S.

Honorary Surgeon and President, The Hubli Co-operative Hospital Society, Hubli

B. D. N., aged 35, was admitted for 'acute abdomen' into the hospital on 13th August, 1936.

He gave a history of fever for about two weeks previous to admission but said he was not confined to bed till the day before when he had acute pain in the abdomen.

Condition on admission.—Temperature 99°F., pulse 124 and respiration 40 per minute, restless, dry brown tongue. Abdomen tender, distended and board-like. Absolute constipation.

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With the history of fever and evident signs of peritonitis diagnosis of perforation was made and laparotomy was done immediately. The perforation was found to be about nine inches proximal to the ileo-cœcal junction and it was found to be about an eighth of an inch in diameter with irregular edges; intestine around the hole was brittle and attempts at closure were futile. It was therefore fixed to the abdominal wall and drainage established in the right kidney pouch and pelvis; the abdomen was gently irrigated with saline and the patient put in Fowler's position. He was discharged with a fœcal fistula on 18th November, 1936, as his general condition was not good enough to allow an enterectomy for the closure of this artificial anus. When discharged he used to pass about two-thirds of the excreta by the anus and the rest by the fistula.

He was re-admitted on 1st March, 1937; his general condition was good and he looked as if he had gained at least fifteen pounds in weight. The fistula was now discharging a little less but evidently there was no chance of its closing without intervention.

He was therefore operated on on the 5th March and the fistulous tract which admitted easily a number 12 cervical dilator was removed by enterectomy and end-to-end anæstomosis was done.

Patient recovered without any subsequent trouble except that he developed slight jaundice on the sixth day of the operation having had a slight rise of temperature up to 100°F. on the previous day.

Fractional doses of calomel relieved him in a few days, the wound healed by first intention and the patient was discharged cured on 12th April.

I am reporting this case because cases of perforation rarely come under the surgeon and even when seen the relatives rarely permit an operation to be done. Of course, in this case, as the typhoid* was ambulant it was not diagnosed before the patient came to hospital and the general condition of the patient also was fairly good so far as emaciation and other typhoid conditions were concerned, but he had had definite peritonitis with the usual symptoms, thready pulse, dry brown tongue and rapid respirations, of over 24 hours' duration.

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*It does not appear that typhoid fever was definitely diagnosed even after admission to hospital.—EDITOR, *I. M. G.*

UNUSUAL CASE OF URETHRAL STONE

By P. P. SHETH, F.R.C.S. (Eng.)
Honorary Surgeon, Civil Hospital, Ahmedabad

A MALE patient, N. V., aged about 60, was admitted into the Civil Hospital, Ahmedabad, on 16th October, 1937, with a complaint of dribbling of urine continuously from the scrotum and perineum for four months.

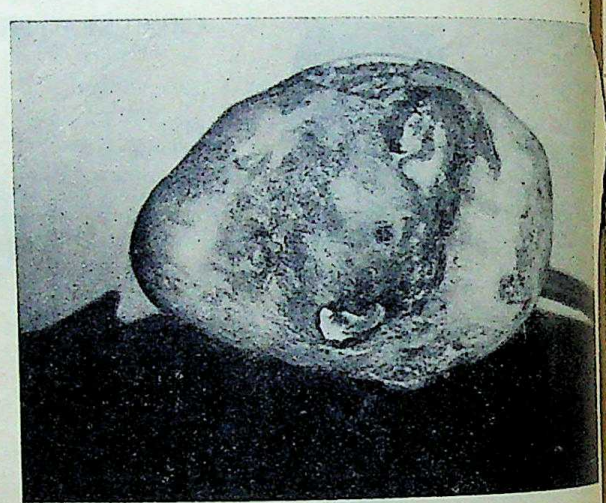
Previous history.—He had a fall from a tree from a height of 20 feet about eight years ago causing a simple fracture of the neck of the left femur. Fifteen days later he developed retention of urine and fæces but was treated and cured. As a result of this fracture he got a deformity on the left side and had a limp. Since then he has had no other complaint until he noticed a painful swelling in the perineal and lower part of scrotal regions which also led to retention of urine, about four months ago. After a few days, both the swellings burst and there was discharge of pus and urine. During the four months di[illegible]g defect is seen on forming and bursting until t[illegible] the stomach, du[illegible] sinuses which discharged pus an[illegible] Often owing to flow thus stopped coming through[illegible] is enlarged and meatus. Patient denied any histo[illegible]e base remain syphilis.

Condition on admission.—The pa[illegible] and had a pulse of about 92 on ad[illegible] tory, respiratory, digestive and c[illegible] appeared normal.

Examination of the affected par[illegible] f a duodenal shining, pigmented and thickened in v[illegible] ulcer niche or scrotum and the perineum and there [illegible] discharging urine and seropurulent m[illegible]erable value, was adherent to the testes; both the cor[illegible] thickened, inguinal glands palpable on [illegible] either by a catheter could not be passed for [illegible]action in three-quarters of the length of the ante[illegible] Per rectum there was felt some hardness in [illegible]vn as a region but there was no pain or tenderness.

Provisional diagnosis.—Stricture of urethra. [illegible]enum

The patient was operated on under spinal anæs[illegible] (stovaine 2 c.cm. of 2 per cent solution) on [illegible]



Urethral stone: weight 79.5 grammes.

October. A perineal incision was made in the line of the membranous urethra, and after passing the Wheelhouse staff the membranous and a part of prostatic urethra were laid open. On further exploration of the region an abnormally big stone was detected occupying the whole of the prostatic and membranous urethra and obscuring the pubic arch. It was removed, the bladder irrigated and the usual perineal drainage done. The surrounding fibrous mass was excised and the wound partially stitched and dressed and then bandaged.

The stone was 2½ by 5½ inches in diameter and weighed 79.5 grammes.

After the operation from 21st to 24th the general condition of the man remained very weak. He was at times delirious, sometimes getting out of bed, and the quantity of urine was less. The patient was kept on urinary antiseptics and sedatives with glucose and barley water by the mouth. On the 23rd he was given intra-muscular cylotropin which was continued to the 26th. He showed signs of improvement from the 26th and since made a good recovery. His perineal tube was removed on 27th and a large rubber catheter (Nom) inserted through the penile urethra and the lower wound allowed to heal. He was making slow progress, but as a result of malnutrition and advanced age he died on the 16th November.

The case is of interest from the unusual site and size of the stone. At first it appeared as if it was a bony growth and gave much difficulty in removal.

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The hormone of the corpus luteum. For use in habitual abortion and menorrhagia.

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FEB 1928

Medical Gazette

FEBRUARY

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saving of lives that would

Air Warfare and

By L. H. G

(From the *Practitio*

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th faith, associated with religion, and the skill
the artist are essential qualities in the make-
up of the practitioner of the science of medicine.

The discovery of new truth must, however, include the rediscovery of old truth, and we need not reproach ourselves because the 'advances' in our science are sometimes nothing but orderly retreats. What was the truth yesterday is often not the truth to-day and yet may again be the truth to-morrow.

From the days of Hippocrates to those of Sydenham, in the consideration of the health of the individual, although the importance attached to airs, waters and places varied from time to time throughout these twenty odd centuries, it was always considerable, and it continued to be so even up to the middle of last century, but with the dawn of the bacteriological era a change in our attitude became apparent; airs and waters were considered of importance only with reference to the bacteria they contained, or did not contain, and places were valued only by their sanitary (*in sensu restricto*) qualities.

'How can this be?' we can hear critics say 'in view of the fact that tropical medicine, where, as the name itself suggests, the whole emphasis is on locality, first appeared as a separate branch of our medical science, during these years?' This is true, but surely tropical medicine as it has been studied and taught during the last half century provides us with the best example of the influence of the bacteriological, or rather parasitological in this instance, outlook; the miasma of the nineteenth and earlier centuries gave way to the anopheles-breeding swamp, and noxious emanations to fly-borne bacterial infections.

But to-day everywhere there are signs of the returning swing of the pendulum and a revival of interest in airs, waters and places. The parasitic theory of disease is unassailable, but we are realizing, more and more, that the parasite is not the only factor that determines disease, that not the seed only but the soil must be considered, that the reactions of the organism itself to parasitic invasion are equally, if not more, important, and that in determining the nature of these reactions no single factor is more important than the environment in which that organism lives.

The study of physiology is an essential part of the medical training and yet little attempt has been made to study tropical physiology; up to the present we have been content to build our tropical pathology on the very doubtful structure of a physiology of temperate climates that has been patched here and there to suit tropical conditions. Even these patches are usually dependent on guess-work and not on systematic investigation. There are numerous examples of our ignorance in the matter of tropical physiology; we are still uncertain whether such a fundamental process as basal metabolism is altered by residence in the tropics, and, although for years it has been tacitly assumed that the hæmoglobin standards of the inhabitants of tropical countries are distinctly lower than those of the inhabitants of temperate zones, when the subject was investigated this assumption was found to have no basis on fact. Similarly, the low gastric acidity of rice-eating races living in the tropics has been shown to be a myth (*vide* p. 65 in this issue).

The subject of Colonel Chopra's very interesting presidential address at the opening of the physiological section of the Indian Science Congress was the effect of climate on the physiology of the individual, and naturally it was the tropical climate with which he was mostly concerned.

We published the first part of this address in our January number (p. 40) and the remainder will be found in the present issue (p. 102). We hope that this address will have the effect of stimulating an interest in this very important subject and of encouraging those who have the opportunity to carry out research work in order to fill some of the many gaps in our knowledge of tropical physiology.

THE KING-EMPEROR'S FUND

THE attention of our readers is drawn to the appeal made by Her Excellency Lady Linlithgow for contributions to establish a fund which will be devoted to combating tuberculosis in India.

The subject is one in which His Majesty the King-Emperor has taken a personal interest and he has consented to the fund bearing his name.

We have always taken a very special interest in tuberculosis, which we look upon as one of the 'tropical diseases' of the future; whereas it is showing a slow but steady decline in western countries, all the available evidence indicates a rapid extension in India. Last year we issued

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a special tuberculosis number of the *Gazette* and this year we propose again to publish one number devoted mainly to this subject.

The object of this fund should have a particular appeal to readers of this journal, as nobody can be more painfully aware of the ravages of this disease in India than members of the medical profession. The medical profession can help the cause of tuberculosis control in many ways and as its members are on the whole poor they cannot be expected to contribute largely to this fund; nevertheless every ... ng defect is seen ... small, helps, and we hope th... he stomach, du... readers will endeavour to m... Often owing t... tribution. We suggest that ... is enlarged and ... who have not already cont... e base remain ... their contributions through ... for forwarding. Any such co... rupee or over) received will b... the pages of this journal and ... f a duodenal ... central fund as a contribution ... lcer niche or ... the *Indian Medical Gazette*.

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Special Article

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THE PHYSIOLOGY OF THE INDIVIDUAL IN THE TROPICS*

Part II

By R. N. CHOPRA, C.I.E., M.A., M.D., SC.D., M.R.C.P.
BREVET-COLONEL, I.M.S.
Honorary Physician to the King
Director, Calcutta School of Tropical Medicine

(*Continued from the January* 1938 *issue,* p. 40)

EFFECTS ON THE DIGESTIVE SYSTEM

Atonia and stasis.—It has frequently been observed by Europeans coming to the tropics that there is a definite impairment of appetite and a lessened desire for animal food. Though this may indicate a diminished power of digestion, it is probable that the disinclination for animal food may be an adaptive response to a lower caloric need in the tropics. There is also a tendency to an atonic condition of the gastro-intestinal tract, as evidenced by an increased tendency to stasis with resultant constipation and gaseous distension. This may be due to sedentary habits and lack of exercise though it is perhaps largely due to the fact that Europeans in the tropics are apt to follow their old dietary habits suited to temperate climates and do not take enough carbohydrates, vegetables and water to provide for the roughage. On the other hand, it is possible that the high environmental temperature in the tropics leads to a vaso-dilatation of the skin capillaries and a reflex vaso-constriction and anæmia of the splanchnic area, resulting in diminished gastric and biliary secretions, and possibly also in an atonic condition of the stomach and intestines. Muller and Peterson (1936) called attention to the fact that, with skin stimulation, the activity of the mucous membrane of the stomach and gastro-intestinal tract was decreased, but with lessened activity of the skin (as with cold) the functional activity of the mucous membrane of the gastro-intestinal tract was increased. It is probable that the inhabitants of warm climates make an appropriate physiological and dietetic accommodation by the greater use of condiments. Spices in solution are known to increase the activity of the villi and secretory glands, and the free use of condiments in the tropics may be an expression of the greater need for gastro-intestinal stimulation where skin activity is normally unduly accentuated.

Gastric acidity.—A general impression seems to prevail that the gastric acidity of rice-eating Indians is lower than that of meat-eating Europeans. Napier and Das Gupta (1935) carried out a fractional gastric analysis on a number of normal Indian male and female subjects and found that on the whole their gastric acidity was higher than in normal Europeans. This is contrary to expectations, for hot climate and diet are both believed to be factors that tend... decreasing gastric acidity. No explanation ... phenomenon is yet forthcoming.

Bacterial flora.—Bacteriologists have claimed that bacterial flora in the intestines of inhabitants in ... tropics are different from those of colder climes. Arn... (1934) has shown that the bacterial flora of the lower intestinal tract vary with external temperatures and hence it is natural to expect a difference between those found in the tropics and the cooler regions. As the nature of the food is also known to influence the relative proportions of the various bacterial groups in the intestinal flora, and as the predominant dietary constituent in the tropical inhabitants is carbohydrate, the claim has much in its favour. Workers in this field appear to agree that an animal protein diet encourages the growth of proteolytic types, whereas the addition of lactose and dextrin stimulates the development of aciduric micro-organisms. Normally, a sufficient amount of lactose in most instances will cause complete transformation of an ordinary mixed flora into one consisting predominantly of streptococcal and lactobacillary types. It has, for instance, been recently shown that banana powder, apple powder, and raisins when fed to white rats subsisting on a high protein diet consisting exclusively of raw chopped beef, produce a change in the intestinal flora from one in which non-aciduric bacteria predominate to one in which *Lactobacillus acidophilus* is the outstanding organism. It has been further pointed out that the simplification of the intestinal flora varies directly with the hydrogen-ion concentration, a pH of 7.0 being characteristic of the gas-producing proteolytic type, whereas an increasing acidity is characterized by a diminution of proteolytic types and the replacement by the aciduric types. It is evident, therefore, that a diet containing sufficient carbohydrate is capable of effecting a complete turnover from a heterogenous Gram-negative type of flora in persons fed on high protein diet, to a flora marked by simplified and Gram-positive, inducing coincidently a change in the hydrogen-ion concentration from nearly neutral to distinctly acid.

Recent work (1937) on the hydrogen-ion concentration of fæces of different classes of persons living in Calcutta shows that, whereas the reaction of the stools of most of the Bengalis is acid, those of the Europeans, Anglo-Indians and Marwaris are mostly alkaline. Although the Marwaris are vegetarians and live on a predominantly carbohydrate diet, they consume very little rice and take more wheaten bread (*chapatis*). It would appear that the consumption of rice produces an acid reaction in the large intestine while wheat produces an alkaline reaction. When Bengalis were put on bread, and rice was cut off, the reaction of the stools changed from acid to alkaline in most cases. In view of the acidity of the stools, it was thought likely that aciduric organisms would predominate in the stools of Bengalis, but surprisingly enough *Lactobacillus acidophilus* could not be isolated.

* Abridged from the Presidential Address of the section of Physiology, 25th Indian Science Congress, Calcutta, 1938.

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grafting and other reconst... the differences, if any, that may ... There are minimum sca... between Indians and Europeans, ... saving of lives that would ... from complete. In an extensive ...rial flora carried out in the School ...e, a non-lactose fermenting Gram- ...*B. pseudo-carolinus*) was frequently ...nal healthy individuals in Bengal. ...ot present in the stools of Europeans ...come to the tropics. It appears to have ...ionship to the dysentery group of ...ting that it is sometimes lysable by ... In this connection it is interesting ...s he...*nilia psilosis* which according to Ashford ...ausal organism in sprue is frequently ...thatta in the stools of persons who are ...suffering from this disease. It is not ...present state of our knowledge to state ...whether such organisms are normal inhabitants ...on stine or whether they play any part in the ...of the disease.

Air Warfare and ...

By L. H. G...

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EFFECTS ON THE RESPIRATORY AND CARDIOVASCULAR SYSTEM

Respiratory frequency and depth of respiration.—There is a good deal of divergence of opinion with regard to the effects of tropical climate on respiration. According to some, the frequency of respirations is decreased while others hold that it is increased before acclimatization. The consensus of opinion appears to be that the rate is diminished but the depth, as indicated by measurements of the minute volume, is increased. A slightly deeper breathing is more efficient for the individual, economizes energy and, at the same time, the increase in the volume of air breathed cools the system. These changes in the rate and vital capacity are probably of a temporary nature, evident only in the case of the white immigrants to the tropics, and are not apparent in the natives of the tropics. Thus, it has been repeatedly shown that the respiration rate in the native residents of India, Java and the Philippines does not show significant changes as compared with the standards obtained in the cooler countries of the West.

Pulse rate, blood pressure and blood volume.—A slight decrease in the pulse rate and in systolic blood pressure is a very common finding in the tropics. Mills (1936) has shown that people migrating from West Central Europe or Central North America to the tropics nearly always suffer a marked fall in blood pressure within a year or two, even though no debilitating disease or infection has occurred. Probably there is a slight decrease in blood pressure due to lowered vasomotor tone and a general slowing of physiologic activity in the high environmental temperature in the tropics, but the changes are comparatively insignificant. The increase in sweating which is necessary in the tropics must require a constantly increased blood supply to the skin, and has been estimated to be as much as 50 times of the amount in temperate climes. The immediate result, if the total volume remains constant, would mean relative anæmia of the splanchnic region and the vital organs in the abdomen. To counteract such circulatory disturbances there is usually an increase in the total blood volume. Barcroft and his co-workers (1923), in an expedition from England to Peru, found that the blood volume increased as the tropics were entered. The rise in blood volume was accompanied by a fall in hæmoglobin indicating that this was a simple dilution effect, blood plasma being drawn into the capillaries from the tissues. These results signify that the organism in the tropics becomes at least temporarily 'wetter' and so is able to sweat more easily and plentifully.

Hæmatological standards.—The pale complexion of the white races migrating to the tropics has been frequently referred to as an indication of anæmia or 'thinness of blood'. Most authorities are of opinion, however, that a tropical climate *per se* does not produce true anæmia. Several workers in the Dutch East Indies including Eijkman (1924) found that the values for red blood cells and the hæmoglobin lay more or less within the same limits for the white sojourner and the native resident of the tropics. Dhar (1937) in Calcutta studied the normal hæmatological standards of a large number of Indian women and found that the average values for hæmoglobin, red cells, mean diameter of red cells and leucocytes are lower than the average figures reported in the European, American and Japanese literature for the same age groups. Indeed, the normal average hæmoglobin value which this worker obtained (11.47 gm.) for Indian women would be considered in Europe and America as bordering on anæmia. Napier and his co-workers (1937) at the School of Tropical Medicine, on the other hand, have not obtained any evidence that the hæmoglobin level in the Indians and in the healthy Europeans in India was low. In the healthy male Europeans the hæmoglobin was usually about 125 per cent on the Haldane scale (17.2 gm. per 100 c.c. of blood) and seldom below 120 per cent (16.6 gm.). This is much higher than the 'normal' figure usually quoted for Europeans in Great Britain In two series of normal healthy Indians consisting of 50 and 30 individuals the mean hæmoglobin contents were found to be 14.77 gm. and 15.70 gm. respectively. Sokhey (1932) in Bombay got a mean of 15.11 gm. in a large series. These figures are not materially different from the normal figures given for males in Great Britain and, if anything, are slightly higher than the standard figure of 14.5 gm. given by Price-Jones. With regard to the number of red cells, the average figures obtained in the Calcutta series were 5,533,000 and 5,362,000 and the mean of the Bombay series was 5,110,000. These figures are again above the classical 5,000,000. Even if the figure of 5,428,000 given by Price-Jones is considered as the normal mean count, the figures obtained in the Indian series are not much below normal and there is no reason to believe that the size of the red cell differs from that in cooler climates and the colour index volume and saturation indices are all in the neighbourhood of 100.

Most hæmatologists in the tropics appear to agree that the white blood cells are generally decreased though the change is not very great. As a rule the polynuclears have been found reduced and the Arneth count shifted to the left. This has been fully confirmed by workers in Iraq and by Dharmendra (1937) in Calcutta. Napier (1935–37) found that the number of leucocytes, if it differed at all, was slightly lower than in temperate climates, but the eosinophile percentage was definitely higher. In 50 normal city-dwelling Indians, who had no heavy helminth infections, the mean eosinophile percentage was nearly 7.0. Not only is the normal eosinophile count of the Indian high, but in disease the eosinophilia tends to attain a very much higher proportion than in the Europeans in temperate climates, *e.g.*, 60 to 80 per cent eosinophilia is not uncommon in asthma and other conditions.

It is not possible, in the present state of our knowledge, to explain the significance of the different hæmatological responses observed in the tropical races. From the findings of Napier and workers in the West, it seems reasonable to conclude that, far from interfering with the functions of the erythropoietic organs, the tropical climate may actually exert some stimulating action on these organs. The possible bearing of the low average white cell count on the defensive mechanism against disease processes requires further investigation.

Biophysical and biochemical changes in blood.—There is little doubt that there is a more pronounced disturbance of water metabolism and water movement in the tropics than in temperate surroundings. This will naturally be reflected in the water content of the blood. A number of observers have attempted to throw light on this important aspect of tropical adaptation by measurement of blood chloride concentration. Sundstroem (1925) working in Australia found that the blood plasma was more concentrated than normal and richer in chloride content in a hot environment. As the formed elements of the blood actually became richer in water, it was probable that there was a shift of water from plasma to corpuscles. Barbour (1924-25) showed that there is considerable dilution of the blood prior to and accompanying the outbreak of sweat in

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hot and humid environment. This hæmodilution may be only temporary as the heat loss through evaporation may reach such proportions that the water in the red cells may be drawn upon to supply the water for perspiration. A slight alkalosis has been reported particularly in persons of sedentary habits which can be removed by water intake and muscular exercise.

The average concentration of serum proteins in the blood of Indians according to Chopra and Mukerji (1931) appears to be slightly lower than the accepted standard figures of Europeans, but the albumin-globulin ratio remains unchanged. The results with regard to non-protein nitrogen content are not conclusive. Since protein intake is likely to be low in the tropics, this will probably be slightly lower than normal. The lipoid constituents of the blood including cholesterol have generally shown lower values. Blood sugar apparently is so much affected by the climate though it was generally believed to be high in the tropics. In view of the common belief that the tropical climate tended to produce an increase in blood sugar, it was thought that diabetes was more common in the tropics. The studies of Mills (1930) have shown, however, that diabetes is more common in the temperate climes. Serum calcium is appreciably increased probably as a result of excessive production of vitamin D from ergosterol due to the radiant energy of the tropical sun. Sundstroem reported a reduction of total phosphorus, but the finding has not been confirmed.

Effect on the nervous system

That hot environment actually disturbs the psychological reactions of the individual migrating to the tropics is generally admitted, but it is doubtful if the climate alone is responsible. The climatic element along with a large number of other factors—social hygiene, isolation, sedentary habits, alcohol, etc.—undoubtedly plays a part. There is, however, a physiological basis for the concept that the higher centres may be influenced by a series of stimuli from the peripheral sense organs and there is a theoretical possibility that the nerve cells in the brain might be exhausted or fatigued if the stimuli are of a type to which the nervous system is not ordinarily accustomed. There are many instances where a close correlation of a pathological nervous state can be made with changes in the climatic and meteorological factors. It is, for example, well known in epileptic colonies that the fit incidence rises when the weather is close and sultry, and before and during storms. Migraine is likewise affected by the weather. Victims of chronic pain have a peculiar interest in the weather. Neuralgia, locomotor ataxia, and other painful diseases are always aggravated when it is damp, cold and windy. The weather may influence the course of chronic psychosis and unfavourable conditions may exaggerate pre-existing states of either depression or excitement.

Tropical irritability.—The intense heat and the bright sunlight of the tropics are the two factors which have been most commonly incriminated as agents in weakening the control of the higher centres over the lower and causing the so-called 'tropical irritability and neurasthenia'. Pediatricians in the tropics have often said that in children, memory, initiative and application become bad after the tenth year. It appears however that the measurable physiological disturbances are on the whole not very significant. It has so far not been possible by physiological, psychological and biochemical methods to furnish the desired evidence for altered functions of the nervous system. There may be, however, non-measurable and subtle nervous effects which may be of fundamental importance in the problem of acclimatization. Residents in the tropics are less prone to feel the depressing effects of a continuous high temperature and humidity, and the nervous effects observed among white settlers are conspicuous by their absence in the natives. There is probably no impairment of the higher psychical reactions and memory traces in the former as has been claimed for the white sojourners.

Effect on the endocrine sy[illegible]g defect is seen

It has often been observed that t[illegible]he stomach, due may be disturbed in tropical clime[illegible] Often owing to of increased metabolism, high ener[illegible] is enlarged and incidence of metabolic diseases in a[illegible]e base remain a sluggish metabolism, a low ener[illegible] resistance to infection and lower inci[illegible] diseases in a tropical climate are ge[illegible] and it is probable that all these fact[illegible] bound up with the question of the acti[illegible] of internal secretion.

[illegible]f a duodenal

Thyroid-adrenal apparatus.—Much e[illegible]ulcer niche or both physiological and pathological, have[illegible] indicating that the thyroid-adrenal appa[illegible] affected in a hot environment. The [illegible]rable value, regulation of patients suffering from myxœ[illegible] the attention of workers to the reaction[illegible] ectomized animals to changes in temperat[illegible] either by thyroid glands of animals reared in a hot e[illegible]action in definite histological evidence of a diminishe[illegible]n as a content has been found. Cramer (1930) [illegible] evidence to indicate that the activity of this [illegible] is diminished after experimental heat exposure [illegible]um certain length of time. So far as the suprarenal gla[illegible] is concerned, a relationship between this gland and hea[illegible] regulation has been established by showing that exposure to cold is a powerful stimulus to its functional activity. According to Mills (1929) definite disturbances of body function due to hypofunction of adrenal glands may result from too prolonged and severe moist heat.

That the thyroid-adrenal apparatus is concerned in the heat regulation of the body is borne out by pathological evidence. Lesions of these glands are frequently accompanied by marked disturbance of heat regulation, and conversely disturbances of heat regulation, as in fevers, frequently produce lesions in these glands. High temperatures are known to affect adrenalectomized animals more easily, and frequently they die in a temperature which is not serious for the control animals exposed for the same length of time. All these facts indicate that there is a lowered resistance to heat in adrenal insufficiency.

These facts enable us to speculate on the close interrelationship that exists between heat regulation and the thyroid-adrenal system and which afford a physiological basis for the study of the fascinating problem of the influence of climate on man. It has often been noted that a warm moist climate with little change from day to day is 'relaxing'. This might be the result of a failure to stimulate the thyroid-adrenal apparatus and through it the sympathetic system. Conversely, the cool variable climate, which is associated with increased activity and energy, probably provides a continued stimulus to these endocrine organs and the sympathetic. Mills (1932) considered that it is by whipping up the glands of internal secretion (especially the thyroid, adrenals and pancreas) that the human organism responds to weather stimulation. The same explanation may be applied to the relation between climate and health. Why is the resistance against certain bacterial infections, such as tuberculosis, increased by a suitably cool, dry climate, and by measures such as open air treatment, hydrotherapy and the like? Hitherto, it has been thought that such measures increase the metabolism. An increase in metabolism however can be induced by other means such as muscular exercise, but this is likely to do more harm than good. The answer to the question probably is that those measures are beneficial which stimulate the thyroid-adrenal apparatus without exhausting it and thus strengthen the normal reactions of defence of the organism against bacterial infections. Conversely a warm, moist, monotonous climate weakens resistance against infections, not because it reduces metabolism as many have thought, but on account of the continued absence of stimulus to the thyroid-adrenal and the sympathetic apparatus.

Sex glands.—It has often been stated that girls in tropical and subtropical regions menstruate at a comparatively early age. It is also a well-known fact that

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children earlier in warmer
regions. These facts have led
opical climate induces premature
s, however, no direct proof of
tistics are available. In India,
mostly between twelve and
been given for the onset of
figures are probably derived from
time of motherhood. The mean
of menstruation is 15 to 16 years
on plantations in Jamaica and
stimulation and earlier maturity of
been observed in North American
climatic changes are more frequent
throughout the year. Mills and Senior
ted data to show that human fertil-
by the conception rate, depends on
ons in the temperature. The maximum
is always found when the mean monthly
around 60°F. (15.6°C.). Mean tempera-
0°F. (21.1°C.) and below 40°F. (4.4°C.)
definite depression in conception rate. Ogle
confirmed these observations by experiments
als and showed that white mice subjected to
humid environments exhibited a low fertility.
results would indicate a definite depression,
of a climatic stimulation of the gonadal activity
the females in the hot and humid regions of the
tropics.

Basal metabolism in the tropics

The question of the influence of climate on the basal metabolism of the individual is an important subject and has received considerable attention during the last three or four decades. No satisfactory evaluation of the effect of the climate on metabolism, however, is possible even to-day, in view of the wide divergency in the results recorded. A review of the work carried out in tropical and subtropical regions in different parts of the world shows discordant results. Time will not permit me to make a detailed survey of the evidence presented by different workers but I will refer to the work carried out in India which is typical of that done elsewhere. Mukerjee (1926), experimenting on 15 Bengali medical students, found that the basal metabolic rate was on an average 9 per cent lower than the European standard (Sanborn standard). Sokhey (1927) found that, in 15 out of 21 students, the basal metabolic rate was 10 to 23 per cent lower than that of the Du Bois standard. This was further confirmed by Mason and Benedict (1931) who found the basal metabolism 16.9 per cent below the Haris-Benedict standard or 17.2 per cent below Aub-Du Bois standard. Mukerji and Gupta (1931) showed a decrease in the basal metabolic rate by 13.3 per cent below the Du Bois standard. Krishnan and Vareed (1932) working in Madras found that the basal metabolic rate was 12 per cent lower in man and 16 per cent lower in woman as compared to Du Bois standard. It is not yet agreed whether this lower metabolism is the result of the tropical heat (Rahman, 1936) or is produced by some dietetic or racial factor (Mason and Benedict, 1931). Bose (1934) carried out a large number of observations by the Sanborn technique at the School of Tropical Medicine and came to the conclusion that the basal metabolic rate of healthy normal Indians living mostly on a mixed diet does not differ materially from the accepted standards of Europeans and Americans.

Taking a general view of the whole problem, it would appear that the observations of the majority of the workers who studied metabolism in the tropics are in agreement that there is either a slight decrease or no significant difference in the basal heat production in people living in the tropics as compared with the inhabitants of the cold or temperate regions. It seems inconceivable that such a fundamental factor as basal metabolism should be affected by climate to any great extent any more than the body temperature. A very low or high basal metabolic rate reported in the literature is probably due to uncontrolled observations or possibly some fault in the technique employed.

Diet and adaptation in the tropics

Protein and fat requirements.—Among all the demands which the body makes on its environment that for food is of outstanding importance, and it is to-day becoming well recognized that correct nutrition may profoundly affect the well-being and the social value of the individual. Considerable attention has therefore been directed to the adjustment of diet for different deficiency diseases and on the question as to how a well-balanced diet, containing all the proximate principles and other important constituents (vitamins, etc.), could be made available to the masses. Caloric value of foodstuffs, which was at one time the basis of dietetic studies, is for the time being relegated to the background, and comparatively less attention is now being paid to their energy and heat-producing properties.

As pointed out before, the adaptation which man is called upon to make in the tropics is primarily one of heat regulation. The problem of diet is intimately connected with the problems of heat regulation, body temperature and metabolic rate, and any of these factors cannot be considered without reference to the others. Though considerable work has been done on different aspects of dietetics, the question of the suitability or otherwise to the tropical climate of the common foodstuffs available in the tropics is not satisfactorily answered. Nature offers fat and protein in the arctic regions and carbohydrates at the equator, and man in these areas has always accepted them as his staple foods. The old idea that the diet which a race has adopted in a particular region is best suited for its needs has been refuted, in the light of modern research on ill-balanced dietaries and nutritional diseases in those areas. It is not yet clear as to what is the optimum or ideal to be aimed at with a view to effecting a suitable adjustment to the climate.

The proportion of protein, fat and carbohydrate varies considerably in the diets of different races, depending largely on the type of food available and also upon the customs existing in particular localities. The prevailing diet of the masses in the tropics is derived largely from vegetable sources and carbohydrates generally predominate in it. Nearly a century ago, Chevers thought that the Hindu dietary with a very moderate quantity of animal food was the one most suited for a tropical climate. It will be of interest to examine how far the generalization of Chevers is justified.

Biological value of proteins. The protein requirement of the tropical races has been the subject of intensive investigation and research by a large number of workers in India and other tropical countries, but no definite conclusions have yet been drawn. It has been pointed out that in many parts of the world those who consume a diet with high protein content have a better physique and are more virile than others of the same race who, for one reason or another, consume less protein. In the north of Italy, for instance, where the protein consumption is higher, the physique is better than in the south. The same statement has been made about India although here racial differences may have something to do with the differences. McCay said about a quarter of a century ago—'As we pass from the north-west region of the Punjab down the Gangetic plain to the coast of Bengal, there is gradual fall in the stature, body weight, stamina and the efficiency of the people. In accordance with this decline in many characteristics, there is an accompanying gradual fall in the nutritive value of the dietaries'. McCarrison working in South India confirmed the findings of McCay and concluded that there is a chronic protein starvation in the dietary of the Indians. Recent researches by Aykroyd and Wilson in this country have shown that the main deficiency in the diet is the lack of proteins of high biological value and certain salts, and this defect in the dietary, which can be easily corrected with small quantities of milk, is responsible for the malnutrition and consequently the poor physique of the children. On the other hand, the fact cannot be overlooked that the meatless diet of some of the finest soldiers of the Indian army has a low protein content. There is already a considerable volume of opinion that the protein intake in the tropics should be less than

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in temperate climates and the Chittenden and Voit standards of protein quota may not be applicable to the Indian dietary. It is well known that protein food, by virtue of its specific dynamic action, generates a good deal of heat. The Eskimos, who live in the arctic zone, consume large quantities of meat, sufficient to raise their metabolism over 50 per cent which is an obvious practical advantage. Such a diet in the tropics would be considered unsatisfactory as it would throw an additional burden on the heat-regulating mechanism which is already over-taxed. From this point of view a low protein vegetarian diet seems logical and advisable in the tropics. Recent researches tend to show that there are a number of important factors which deserve special attention in determining the minimum quantity of protein necessary to preserve nitrogenous equilibrium, *e.g.*, the particular protein the subject is accustomed to take and the ratio of the inorganic bases to inorganic acids available to or formed in the body of the subject. The coefficient of absorption also varies enormously in proteins of animal and vegetable origin. Inhabitants in the tropics usually obtain a large percentage of their protein requirement (70 to 80 per cent) from vegetable sources while Europeans do not draw more than 25 per cent from this source. Vegetable protein is said to have less 'biological' value than animal protein. It is futile to work out an allowance of say 80 gm. of protein per day, if a good portion of it is derived from vegetable sources with poor 'biological' value and it may not be assimilated. Then again, a food may show variation in the absorption of its protein content merely because of various methods of cooking. For instance, *dals* (lentils, commonly used in Indian dietary) if not properly cooked lose a lot of protein value. If they are simply boiled until soft, as is usually done and consumed, about 40 per cent of the protein content is lost from non-absorption. If, on the other hand, they are mashed and cooked with special attention to the temperature and water content, the loss is not so great. This also applies to rice which is the staple article of diet in a large part of India. A diet, theoretically perfect, may still be quite unable to supply the physiological needs of the race for whom it is intended. It is therefore of utmost importance that, in assessing the amount of protein in a diet, its source should be known and the computation for protein requirements made, with special reference to the manner in which it is going to be available for final consumption.

Fat-free dietary.—It is a common experience in the tropics to find that the poorest classes live on an almost fat-free diet. The very small amount of fat that they do eat is also often adulterated. Thus, mustard oil which is consumed by quite a large section of the population in Bengal is often impure and contains adulterants; the palm oil of other tropical dietaries is very variable both in fat and vitamin content. That fat is an important constituent of diet has been long known but that it is also an essential constituent which cannot be replaced entirely, for instance, by carbohydrates was not realized before. Recent researches have forcibly stressed the fact that fats, if completely excluded from the diet, might lead not only to stunted growth but also to the development of various lesions indicative of malnutrition in the body. The fatty acids in fat are probably quite as important as the fat-soluble vitamins. From these considerations, it is logical to conclude that the almost fat-free diet of the Indian races is an important cause of the general and wide-spread malnutrition. From the point of view of adaptation to a tropical environment a diet comparatively poor in fat has obvious advantages. In the colder parts of the world, where harder physical work can be, and often is, performed, a fairly high caloric intake is necessary and this cannot be supplied without including a generous proportion of fat. A caloric intake of a Canadian lumberman of 9,000 calories, for example, could not be consumed as starch without putting too much strain on the demands of the alimentary canal. Fat is much less bulky than cereal foods and, bulk for bulk, is a much richer source of energy and heat. Besides in the tropics an unduly large layer of body fat—external or internal—is ne[ed]

cooler regions, which naturally [re]duces the demand for it in the dietary.

Carbohydrate in the dietary.—[It] definite and important effect [on] mechanism of the body. Numer[ous] that a change from a fat diet to [a] considerable retention of water a[nd] of it is taken up by the stored g[lycogen] extra fluid in the extracellular a[nd] cellular fluids. In other words, on [a] an increased amount of water is av[ailable] tion and urine secretion in case of [a] carbohydrates are always the first [to] and hence *pari passu* more motile [and] while they are being consumed. Exp[eriments] on a fat-free diet have shown that th[ey] sume more water and excrete actually [more] others with fat in their diet. More fluid is eliminated by the lungs, under such [conditions] Further, pulmonary ventilation is greater [than] hydrates are being burnt, owing to a larger carbon dioxide per calorie of heat than on a [fat] This would increase the heat loss by evaporation water from the lungs. These experiments are [sug]tive in view of Eijkman's (1924) observations in [Java] He found that the Malayan is more economical (physiologically) in his water elimination than the European. Under identical conditions, a European loses 143 gm. of water and a Malayan only 105 gm. of water by insensible perspiration in a given period. Contrary to expectation, the Malayan had also the smaller volume of urine, even though he had received extra water, while the European had been deprived of it during the observation. The European appears to waste water as liquid perspiration which does not therefore perform its physiological function, namely evaporation and heat loss. The problem therefore is how much of this adaptation is racial and how much of it is due to carbohydrate diet conserving the body fluids. The increased urine elimination of the European may have been due to his greater excretion of nitrogenous products which would be much less in the Malayan with his low protein diet. The Malayan, on the other hand, may consume more salt, which under certain circumstances promotes retention of water.

The considerations set forth above are particularly important if we are to construct a dietary suited to the climatic conditions of the tropics. Some medical men obsessed by the idea that a good dietary must be rich in protein and fat, have advocated the wholesome use of the protein-rich European dietary for the tropics overlooking the fact that whole nations and working classes can develop satisfactorily and lead healthy and mentally productive lives on a diet which is almost equivalent, as far as caloric value is concerned, to the European diet but which is very poor in animal protein. It seems that dietary types like racial patterns cannot be laid down in rigid terms. The dental structure and alimentary canal of man are pre-eminently suited for a mixed diet and he is therefore probably capable of adapting himself to diets varying widely in their compositions. The determination of the minimum animal protein requirements is an interesting subject for future research and it is possible that these depend considerably on climatic considerations.

TROPICAL CLIMATE AND RESISTANCE TO INFECTION

WE have so far considered the effect of tropical climate on the individual involving chemical, physiological and psychical reactions. It would be interesting now to examine whether these changes extend to the bacterial flora of the mucous membranes of the throat, respiratory passages, the gastro-intestinal tract and other parts of the body. It is possible that climatic factors not only influence the physiological forces of the organism but also affect the pabulum on which the bacteria vegetate without in any way affecting the bacteria themselves. This brings us to the question of environment and host resistance, the importance of which from the epidemiological point of view cannot be over-rated. It seems logical enough to expect

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drafting and other reconst[illegible] that has already been presented There are minimum sca[illegible]n of the chemical, hormonic and saving of lives that woul[illegible] individual as a result of environ-[illegible]ocalization of bacteria and other [illegible]e tissues is favoured by associa-[illegible]nembrane permeability, vascular [illegible]erations and ionic shifts. If these [illegible]n the particular foci, such as the [illegible] mucous membrane of the gastro-[illegible]or host parasite relationship may be [illegible] disorder may result.

Air Warfare and

By L. H. G[illegible]

(From the *Practitio[illegible]*

If air war shoul[illegible] practitioner and u[illegible] every section o[illegible] have certain s[illegible] him in his te[illegible] tions for the[illegible]

The prac[illegible] (1) A [illegible] air warfa[illegible] aircraft [illegible] (2) [illegible] stance[illegible] on the[illegible] (3) [illegible] pro[illegible] of [illegible] the[illegible] e[illegible] the bactericidal power of the dog. Again bacteria injected into the ventrally fixed duodenum of dogs placed in warm rooms soon appeared in the cæcum in large numbers. The same animals, handled in a like manner at ordinary room temperature, destroyed the bacteria before they reached the cæcum. Since in these experiments gastric acidity was excluded, one must assume that there was some other factor besides gastric acidity, or, in other words, that the humid heat caused a change in the bacteriolytic action of the intestinal mucosa. In mice infected *per os* with the same dose of *Salmonella enteritidis* the fatality at a high temperature and high humidity was almost three times what it would be at the same temperature but with low relative humidity.

These experiments show that high temperature associated with high humidity favoured the passage of infecting organisms across the gastro-duodenal barrier and increased the permeability of the intestine so that the bacteria could pass into the lymphatics, and finally reduced the defence of the animal to such an extent that the severity of the infection was enhanced. The fact should not be lost sight of that these experiments dealt with sudden changes of temperature and humidity. Had the experiments been conducted on animals acclimatized to a tropical climate, the results might have been different.

In attempting to correlate the experimental findings with clinical data, we are confronted with certain difficulties. It is known that enteric infections, dysenteries, diarrhœa, and colitis increase during the spring and summer months and diminish during the winter. This increase, which is often sharp and sudden, is partly ascribable to the sudden rise in the external temperature which probably inhibits the gastric secretions and allows either infectious organisms or irritating toxic substances to pass more readily into the lower intestinal tract. Furthermore, it would appear that at a high humid temperature the intestinal tract is also more sensitive to the irritating substances produced by the normal intestinal flora. Mills (1928) in China called attention to gastro-intestinal disturbances, associated with nausea and vomiting, following a sudden elevation in temperature and humidity. Similar effects have often been observed in India and Egypt. A sudden change to a high, humid temperature may therefore facilitate infection, or give rise to non-specific irritation. It is possible that there are certain other factors such as seasonal changes in the vitamin content of foodstuffs which are responsible for the rise and fall of resistance.

Goldwasser and Kligler (1930) studied the character of the intestinal flora of normal individuals during different months of the year under the influence of the usual diet. The number of bacteria excreted by a normal person was variable. During winter, the number of bacteria was relatively high, and cocci and anærobic spore formers predominated, while in spring there was a transformation with a fall in the bacterial content with the coli group preponderating and cocci and spore-formers diminishing. This indicates that, associated with the sudden rise in temperature, there are changes in the intestinal tract favouring the development of saprophytic and pathogenic members of the colon-typhoid group. The accumulated data go to show, therefore, a seasonal flux in the condition of the intestinal tract of man, while the experimental results obtained with animals show to a large extent that corresponding changes are induced in them by a change from an environment with a high to one of low cooling power.

Evidence of significant changes in the physiological condition of the nose and nasopharynx in response to changes in temperature and humidity has been produced and it may well be that some of the changes are associated with a lowering of local resistance and a predisposition to cold and other respiratory infections. Cock and Mills (1932) investigated the effect of atmospheric conditions on the upper respiratory tract and found evidence to indicate that it was not only the bacteria which were responsible for the catarrhal inflammation in the respiratory tract, but environmental factors such as seasonal alterations in temperature and humidity were also important accessory factors. External temperature and humidity were important controlling factors in the incidence and death rate of lobar pneumonia. In diseases like asthma, many workers in the field have recognized the influence of climatic variations and have more than once shown the association of climatic fluctuation with asthmatic attacks. Evidence has also accumulated which shows the seasonal fluctuations of streptococci in the throat and the severity of attacks of rheumatism and rheumatic arthritis. Wheeler, Wilson and Leask (1935) made observations on 4,857 throat cultures from 123 rheumatic children and have shown conclusively the close relationship of the pharyngeal flora with seasonal variations and the incidence of rheumatic attacks. Sharp and John (1937) have shown that carriage of hæmolytic streptococci is at a low level during the summer season and the warm climate of the Southern States of America tends to prevent or mitigate an attack of rheumatism. More information however is needed to prove direct correlation between environmental features and naturally occurring infections of the respiratory passages.

Radiation and resistance to infection.—It has been suggested that ultra-violet irradiation of the body, which is naturally obtainable in the tropics, has the power of increasing resistance to infections. A number of workers have demonstrated a temporary increase in the bactericidal power of the blood as the result of exposure to ultra-violet rays. This view is, however, not universally accepted. A careful study of the frequency of colds among irradiated and unirradiated groups of volunteers at Johns Hopkins Hospital has definitely shown that resistance to infection is not altered by irradiation. Similar results were obtained with rabbits injected with *Pasteurella lepiseptica*.

Immunity reactions.—I do not propose here to enter into the field of immunity reactions and immune bodies in relationship to climatic changes. It is certain that the titre of immune bodies will change with the alterations in the physico-chemical status of the blood. The Report of the New York State Commission on Ventilation (1923) states that rabbits maintained at a temperature of 86–F. (30°C.) showed distinctly delayed formation of hemolysins and reduced agglutinating power, as compared with control animals kept at 68°F. (20°C.). It has been recently shown that in rabbits, heated so that their body temperature is raised to above 104°F. (40°C.), agglutinins and bacteriolytic substances are produced in greater quantities than in control animals kept at room temperature. These preliminary studies indicate interesting inter-relationships and open up a new field of investigation.

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Allergic manifestations.—A few words may be said about hypersensitiveness and allergy in the tropics as the phenomenon is closely associated with resistance to infection. The Indian tribes of America suffered much less from allergic diseases and were much less susceptible to experimental serum disease than the white races. Acton and Dharmendra (1933) pointed out the rarity of asthma of allergic origin amongst Indians. The reason for this lower incidence is not known and will remain unanswered until the true nature of allergy is known. There is evidence, both experimental and clinical, that hypo-adrenia plays an important rôle in the production of allergy. It has also been claimed that slight changes in the biochemical make-up of the body might give rise to profound changes in the reactions to foreign bodies and external stimuli. It has been shown, for example, that a shift of the hydrogen-ion concentration to the alkaline side greatly increases sensitiveness in certain tissues. I have already indicated that hypo-adrenia might well be brought about as a result of tropical heat. If this hypothesis is accepted, a higher incidence of allergy in the tropics would be expected. Apparently such is not the case. This question must be thoroughly studied before any satisfactory explanation can be offered.

CONCLUDING REMARKS

From the survey of the effects produced by tropical environments on the physiology of the individual, certain points emerge which are worthy of further consideration and discussion. The idea that living bodies receive modifying impressions, both as regards form and quality, from the physiological environment is of ancient origin and may be said to be definitely established by the experimental physiological data now available. There are however many lacunæ in our knowledge of the physiology of the external environment which need filling so that we may present a connected account of all these alterations in the functions of the human organism. The human organism (the microcosmos) swings in a definite rhythm with the macrocosmos (atmospheric environment). In the interplay of the meteorological rhythm with the biological rhythm of the individual, there may be synchronization, amplification, summation, or negation of effects, depending on the type and reactivity of the individual. It is conceivable, for example, that a long, thin, flaccid individual will react to an environmental feature such as atmospheric temperature, differently from a florid, stocky and strong type of individual. This brings us to the important question of 'constitution' and shows how the question of normality may be inter-related ultimately to the constitutional types. For all practical purposes, however, it is not necessary to consider such individual fluctuations and peculiarities, as many of these variations are smoothed over and neutralized when larger groups are considered. It is therefore to standardize physiological data in terms of 'normal' and 'normal ranges' that we consider groups, and not individuals.

There is great need for determining such physiological normals in the tropics. Even in such simple matters as body temperature, blood pressure, etc., the findings are not always in accord. The question of a normal standard must necessarily be one for revision in the light of additional data and more exact technique. The differences of technique alone account for much of the difficulty in correlating earlier results on blood chemistry and blood pressure. When we are in a position to compare alterations produced in response to tropical environment, in terms of 'normals' fixed in the tropics on 'tropical' individuals, we will not only be able to understand and explain their significance more fully, we may also be able to find out the optimum environmental conditions necessary in the tropics for the maximum development of physical and mental vigour. That environmental factors determine to a great extent the progress of mankind, Huntington has shown, and many of his conclusions have been confirmed by Mills.

The immediate effects of tropical heat and humidity on the inhabitants of cooler climates are known. Most of the physiological measurem[ent]s g defect is seen either on white races migrating [to] the stomach, duo best on white settlers in the t[ro]pics. Often owing to cannot be used satisfactorily to [the] is enlarged and of the tropical climate would re[ve]al These records of altered physio[logy] base remain are no doubt useful indications of [what] to be expected, but any comparison figures as the standard will naturally value. Creditable attempts have [been] pioneer workers in the Philippines [to] a duodenal supplement the information obtained [from] ulcer niche or by carefully controlled experiments [in] ficially produced tropical environment[s] rable value, experiments have supplied a large [amount] data but these are also subject to the [same] The experiments were conducted for [short] either by and though the results look quite conclusive [in] they go, they throw no light on how [the] action is tomed to tropical environments for generation as a react to climatic changes. There is much [room] work of this kind in India with local [strains] animals reared under conditions peculiar [to] country.

The question of basal metabolism and the [other] related problems of optimum diet in the tropics need further investigation even though the available data are by no means meagre. There seems to be some evidence to show that metabolism in the tropics is slightly lower than in cooler climates. As this observation fits in remarkably well with the known physiological facts regarding heat regulation in the tropics and the diet in the tropics is predominantly rich in carbohydrates and poor in fats and proteins, European investigators are prone to lean to this view. Work in the Calcutta School of Tropical Medicine, however, has shown that there is hardly any difference in the basal metabolic rate in apparently healthy Indians (Bengalis) subsisting on an ordinary mixed diet. It is important, therefore, to re-investigate the problem and to see whether any racial factor is involved in it. Intimately associated with the question of basal metabolism is the question of the functional activity of the endocrines. There is some evidence to show that tropical environments depress the thyroid-adrenal apparatus as well as the gonads, and the sluggish metabolism, the lower energy rate, the earlier onset of the menopause and the supposed lowering of human resistance are only expressions of this endocrine dysfunction and inadequacy. Here lies an aspect of physiology which should attract young scientists. While some observations by histopathological and histochemical methods on the colloid content of the thyroid gland and the presence or absence of 'granules' in the cortex and medulla of the suprarenals have been recorded as evidence of their altered function, and while quite a large volume of work indicating the active participation of the supra-renal glands in the process of 'chilling' has emanated from the laboratories of Prof. Cannon of the Harvard University, there is as yet no definite and direct proof of this endocrine insufficiency or dysfunction under tropical environments. No satisfactory method exists for estimating the amount of adrenalin in the circulating blood and body fluids. If such a method can be devised and the technique perfected, it will be a distinct advance in the study of the activity of the endocrine functions of individuals living under different climatic environments and in correlating this activity with increased or decreased metabolism, increased or decreased resistance to infections, increased or decreased somatic reflexes and psychical status of individuals. It has been reported that the incidence of metabolic diseases, like diabetes, exophthalmic goitre, and Addison's disease, pernicious anæmia, angina pectoris, chronic nephritis etc., is lower in the tropics than in the temperate zones, while, on the other hand, the infectious diseases generally are more common. It is also a general belief that sexual maturity is gained earlier in the tropics than in cooler climates. Recent researches however tend to indicate that the reverse is probably true. Much useful work could be done in this connection in India. It

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By L. H. G re on the subject, one is forcibly
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of climatic environment. This adjustment is brought
th about by three major components of the autonomic
c apparatus—chemical, hormonal and nervous. We have to study all these systems in all their various phases and ramifications, correlate all the disjointed observations in logical sequence and fit them into a perfect mosaic. Only then can we hope to project a picture, complete in its details, of the phenomena of biological adaptation of the organism to its environment, as exemplified in the process of acclimatization—individual or racial—of human beings in the tropics. In modern medicine and physiology, a consideration of the environmental influence has been relegated to the background for it has been thought that all acute infectious processes and normal physiological events run a comparatively steady course, uinfluenced by environmental factors. Enough scientific evidence is now available, some of which has been discussed already, which leaves little room for doubt that environmental factors are important forces to be reckoned with and that when these are studied in greater detail, particularly with reference to the changes that they might produce in the human organism, a new branch of physiology may be developed in this country. The material is in abundance; but it needs the sickle of properly organized and directed research to garner a harvest which will be of the greatest value to us in India as well as to the world at large.

Medical News

LADY LINLITHGOW INAUGURATES CAMPAIGN AGAINST TUBERCULOSIS

King-Emperor's personal interest

UNDER the auspices of His Majesty the King-Emperor, an appeal on behalf of a fund to combat tuberculosis in India was launched on 1st December by Her Excellency the Marchioness of Linlithgow.

To be known as the King-Emperor's Fund, the project will commemorate in India the accession to the Throne of His Majesty the King-Emperor, who has graciously consented to its inauguration.

His Excellency the Viceroy is in whole-hearted sympathy with the proposal, which is also obtaining the support of Governors of the Provinces, Ruling Princes of the Indian States, Members of the Viceroy's Executive Council, the Presidents of the Council of State and the Legislative Assembly, and the Chief Justice and Judges of the Federal Court of India.

The purpose of the fund will be the establishment and financing of an All-India Association for the prevention and treatment of tuberculosis. The Association will consist of a central organization at the headquarters of the Government of India, supported by Provincial and possibly State organizations, which will be expected to affiliate with the Central Body. A uniform policy will be applied to the circumstances of the various localities in which tuberculosis prevails.

ATTACK FROM FRESH ANGLE

His Majesty the King-Emperor has taken a personal interest in the problem of tuberculosis in India.

Her Excellency Lady Linlithgow has been intimately associated in recent years with all developments in tuberculosis work, more particularly with the work of the Papworth Settlement in England where, in addition to hospitals for men and women patients, an elaborate after-care scheme has been developed with outstanding success.

No one who knows India doubts that of all the diseases which afflict the country, tuberculosis is at once one of the most deadly and the most insidious and the one which most needs attack from a fresh angle.

The new organization will not supplant but expand the existing tuberculosis organizations, which are supported by the King George V Thanksgiving (Anti-Tuberculosis) Fund, and will augment preventive and curative work sponsored by central and provincial public health authorities.

Of the money raised it is proposed that 95 per cent should be retained for local purposes, the remainder being earmarked for expenditure on central activities. In view of the great need which this appeal is to meet, it is hoped that a very substantial sum will be raised in response to it. Several handsome donations have already been received or promised.

Her Excellency's appeal

The following is the text of the appeal issued by Her Excellency:—

'I have for a long time been deeply interested in the work which is carried out in England to combat tuberculosis, and, turning my mind to the same subject when I came to India, I have found that here also this terrible disease has been working incalculable harm.

'From inquiries which I have made I am satisfied that of all the evils which afflict India and which charitable endeavour, strengthened by adequate resources and properly directed, can help to mitigate, tuberculosis is at once the most deadly and one which most needs attention in a fresh aspect. Everyone who has experience of the ravages of tuberculosis must know how dreadful a danger it is to the life, the happiness, and the spirit of the community.

'I believe that the public conscience in almost every class of society is already greatly stirred by the menace of tuberculosis, and I feel that it would be difficult to render the people of India a better service than that of trying to protect them against this terrible scourge.

'I know too that the disease is primarily an urban one; but the extent of its increase in recent years in rural areas shows how important it is to extend preventive measures to those areas also.

'I have therefore decided to appeal to the whole of India for the collection of money on as large a scale as possible to finance a determined and continuing campaign against the spread of the disease.

HIS MAJESTY'S APPROVAL

'I am happy in being able to announce that His Majesty the King-Emperor has approved my plan and, by way of showing his direct and immediate sympathy with it, has graciously consented to the Fund which I propose to raise being named the King-Emperor's Fund. All will agree that there could be no more fitting and beneficent memorial of His Gracious Majesty's Accession than a Fund such as this. His Majesty's interest in the scheme is close and personal and he has

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asked to be kept informed of the progress of my undertaking.

'If I am as successful as I hope to be, it is intended to found an Anti-Tuberculosis Association for India, consisting of a Central Body supported by Provincial and State organizations, which would be expected to affiliate themselves to the Central Body, and to apply a uniform policy to the circumstances of the different localities in which tuberculosis prevails. The expenditure in the Provinces and States would be mainly on the maintenance of clinics and where possible on sanatoria and after-care settlements, while the expenditure at headquarters, directed by experts and representatives of the affiliated organizations, would be on research, the providing of technical advice and general co-ordination of effort, and on a central model clinic in Delhi.

Co-operation necessary for success

'But as the most effective and really concrete work falls to be done in the Provinces and States, I propose that of the monies raised in the Provinces and States in answer to this appeal as much as 95 per cent should be returned for local expenditure, and the remaining 5 per cent, together with any subscriptions that may be voluntarily earmarked by the donors for expenditure on central activities, should be retained by the Central organization.

'The people of India are well known for their charity and their benevolence to suffering humanity. I feel confident therefore that my appeal will be received with the sympathy it surely deserves. It is a most earnest and sincere appeal. I myself will spare no effort to prosecute it and at all times to aid in the fight against tuberculosis to the best of my power. But success demands the practical co-operation of the people of India themselves; and I hope with all my heart that I will have this in full measure.

'I hope that everyone in India, rich and poor, will contribute according to their means—much or little—to this great cause, grasping a noble opportunity of united effort to oppose a great evil in India and to promote the highest welfare of her people'.

H. E. the Viceroy's call to action

In a message accompanying the appeal His Excellency the Viceroy said:—

'The appeal which Lady Linlithgow is making for the King-Emperor's Fund for the prevention and treatment of tuberculosis in India has my warmest and heartiest support.

'I know only too well the ravages which tuberculosis has caused and is causing in India, and the threat which it constitutes to the health and the happiness of her peoples and the development of this great country cannot be exaggerated.

'From the enquiries I have made in many quarters, and from my conversations with persons well acquainted with the preventive measures which are being taken, I am fully alive to the importance which Indian public opinion attaches to early action to safeguard the position.

'Of the sums now to be collected 95 per cent will be attributed for disposal to the Provinces and the States in which they have been collected, and I am confident that public spirited individuals in provinces and States alike will seize this opportunity of showing by their generous contributions and the importance which they attach to safeguarding the area with which they are most closely associated, and that the response to the appeal which is now being made under the gracious patronage of His Majesty the King-Emperor will be outstanding in character'.

King-Emperor's donation

When the list of donations to the Tuberculosis Fund was opened on 1st December, it was headed by the King-Emperor and included notable contributions from all over India. The list ouremen[illegible]g defect is see[illegible] was as follows:— -rating the stomach, d[illegible]

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Her Majesty the Queen
Empress £250 .. ..
Their Excellencies the Viceroy and Lady Linlithgow .. h.
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His Highness the Maharaja and the Government of Jodhpur .. .. Rs. 2½ [illegible] niche o[illegible] value
His Highness the Maharaja of Bikaner .. .. Rs. 2¼ la[illegible]
His Highness the Maharaja of Indore .. .. Rs. 2 lakhs[illegible] r by in

Donations of Rs. 1 lakh each were received [illegible] His Highness the Nawab of Bhawalpur, the Co[illegible] of Regency, Nabha State, and His Highness [illegible] Maharaja of Morvi, Rs. 75,000 from His Highness [illegible] Maharaja of Patiala and Rs. 30,000 from the Cham[illegible] Darbar.

Formation of local committees

Committees are to be formed as soon as possible in all Provinces, Administration and States to raise subscriptions on behalf of the appeal made by Her Excellency.

These committees will announce the names of those authorized by them to receive money on their behalf.

Donations to the Fund may be paid either:

To the representatives of these committees; or,

In a place where there is no branch of the Imperial Bank, into any Government treasury or sub-treasury in India, or

Into any branch of the Imperial Bank of India, for credit to the account, when opened, of the committee of the area concerned.

Donations may also be sent direct to the Honorary Treasurer (Mr. A. C. Badenoch, C.S.I., C.I.E., I.C.S.) or the Secretary (Lieut.-Col. R. O. Chamier, C.I.E.) of the appeal at the Viceroy's House, New Delhi.

Donations received direct in New Delhi, unless expressly designated as for the centre, will be allocated to the Province, Administration or State from which they emanate.

Lists of donations will be issued periodically by the local committees in Provinces, Administrations and States and by the headquarters of the Fund at New Delhi in respect of sums received by each.

SCIENCE CONGRESS JUBILEE

H. E. the Viceroy's opening speech

His Excellency the Viceroy opened the Silver Jubilee Session of the Indian Science Congress at Calcutta on 3rd January in the presence of a distinguished gathering of British and Indian scientists and prominent foreign visitors.

A delegation of the British Association, who are visiting India for the Congress, formed a large part of the audience which heard the Viceroy's address and the inaugural speech delivered by Sir James Jeans, leader of the British delegation.

Amongst British physicians present were Dr. E. P. Poulton, Physician to Guy's Hospital, London, Dr. E. Mapother, of the Maudsley Mental Hospital, London, Professor F. A. E. Crew, Professor and Director of the Institute of Animal Genetics in the University of Edinburgh, and Professor P. A. Buxton, Professor of Medical Entomology, London School of Hygiene and Tropical Medicine.

His Excellency congratulated the Indian Science Congress on the successful completion of its first 25 years. He felt it had been a happy decision to make the special character of the session the extension of invitations to representatives of the British Association and to scientists of other countries to join the discussions and celebrations.

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By L. H. G. to the death of the late
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The prac an to interest themselves in science and to
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aircraft the consequent increasing scientific activities
(2) a the want was felt of an institution which would
stance meetings of workers in different branches of
on the to further the cause of science and to bring
(3) eds and services to the notice of those who are
pro position to help in its objectives.

Indians' ventures

The aims with which the Indian Science Congress
the sociation was founded were threefold. First, to
encourage research and to publish the results amongst
scientific workers in India; secondly, to give opportunities for personal intercourse and scientific companionship; thirdly, to promote public interest in science. These aims have been magnificently fulfilled.

'At the first meeting of the Association there were five sections, chemistry, physics, geology, botany and ethnology. The membership was 109 and 31 papers were read.

'At this year's conference there are 13 sections, a membership of more than 1,600 and 800 papers have been notified for reading. There are to be 22 discussions within individual sections and 10 joint discussions on programmes which concern more than one section.

India's scientists

'*India to-day can claim not a few scientists, the originality of whose contributions in different branches of science has won for them international recognition, and I feel that the presence of so many eminent scientists from abroad sets the seal of international recognition upon the position to which science in India has now attained.*

'The future of science in India is full of encouragement. India has demonstrated that she possesses men of capacity with the will to labour, and if we have workers equipped to take their place amongst those who to-day in every continent are engaged, whether in pure or in applied science, in advancing the frontiers of human knowledge, it is evident that India affords limitless opportunities for the harnessing of that knowledge for the betterment of mankind.

'By universal accord the first and foremost object of our endeavour in the material field must be to better the lot of the agricultural population, to raise the standard of living of the cultivator.

Fascinating challenge

'I can imagine no more fascinating challenge to young scientists in this country than the employment of their brains and the application of the latest scientific knowledge to the attempt to solve the manifold problems of material advancement that confront us on every side.

'But encouraging though the prospect may be in theory, India is faced with the same practical difficulties that other countries experience of making provision for research and scientific activities.

Government's burden

'*But the financial burden of this research falls either immediately or in the long run on Government. Research institutions are almost exclusively maintained either by the Central or Provincial Governments. The work of the universities is substantially subsidized by the Governments of the Provinces in which they are situated.*

'*It is to my mind an unsatisfactory state of affairs that Government, with the manifold calls on its financial resources, should have to bear the main burden also in this respect.*

'The scope for scientific research, whether pure or applied, is practically unlimited and no small obligation exists on private munificence to supplement what Governments are now doing in work which Government has for so long so anxiously supported, and to which it continues to-day directly or indirectly to contribute on no mean scale.

Science's opportunities

'The opportunities of science are great—the field remaining to be explored immense. I am confident that in asking for a still further development of the substantial assistance which over so many years has been afforded by generous donors, I can rely on a response comparable in some degree with the needs to be met.

'The presence of this distinguished gathering constitutes a manifestation of the interest taken by the intellectual world of the West in the trend of developments in India. Interest from such a source is of inestimable value to India at the present time. It will, I feel, continue to be of value in the future.

'India is in a transitional stage; she is on the threshold of a new era. We may anticipate that the recent political reforms will inevitably find their reflection in an increased determination among Indians that India should continue in increasing degree to make her own individual contribution to world history and world concepts.

'What will be the nature of that contribution and what its scale, it is difficult to foresee clearly at this period.

'The history of Indian civilization goes further back than any history of Western countries. The great name of India has throughout that long history at all times been associated with religion, with mysticism, with philosophy and with the arts.

'Throughout the centuries her economy has been, as indeed it is likely to continue to be, fundamentally agricultural, with the simple patient, methodical and thrifty life for the people which that implies.

Challenge to accepted thought

'*With the march of the years there has come the inevitable impact of the West and India to-day is engaged in welding on to her old structures the newer political and economic forms of the West, in finding in her intellectual life a place for the discoveries of science with all their challenge to accepted modes of thought and practice.*

'This is a time, therefore, when interest, understanding and sympathy are vital from those especially who are leaders in science and in those kindred activities which have been so dominant a characteristic of Western development in recent years.

'When talking of civilizations it is difficult to dissociate a scientist from the background against which he works and from the effect of his work on the development of his times. The scientist has his place not only in the world of science but in society as a whole.

'The backgrounds against which scientists in India and the West pursue their activities are vastly different and the possible effects on society from the impact of their discoveries on everyday life must inevitably vary.

India's spirituality gives hope

'But that difference in no way diminishes the value to us in India of the informed interest, advice and wide and varied experience of those who have seen the possibilities and the limitations of scientific activity in other spheres.

'Your knowledge, your experience, your very aloofness from the Indian background will impart a special value to any analysis of the problems which confront us here, and to any suggestions, which, in the light of your

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deliberations, you may feel able to advance as to the directions in which investigation and examination can most fruitfully be pursued.

'But the value of the visit will not be felt on one side only.

'Even the most enthusiastic believer in Western civilization must feel to-day a certain despondency at the apparent failure of the West to dominate its scientific discoveries and to evolve a form of society in which material progress and spiritual freedom march comfortably together.

'Perhaps the West will find in India's more general emphasis on simplicity and the ultimate spirituality of things a more positive example of the truths which the most advanced minds of the West are now discovering.

'Is it too much to hope that you, gentlemen, will be a channel through which India will make in increasing degree that contribution to Western and to world thought which those of us who know and love India are confident that she can make in so full a degree?'

THE INDIAN HONOURS LIST

1ST JANUARY, 1938

THE following are the names of medical men and others, associated with medical institutions, in the Indian Honours List of date 1st January, 1938. We offer them our congratulations:

K.C.I.E.

Major-General E. A. Walker, C.B., I.M.S., lately Director of Medical Services in India, Army Headquarters.

C.I.E.

Colonel P. S. Mills, I.M.S., Surgeon-General with the Government of Bengal.

Lieutenant-Colonel F. A. Barker, O.B.E., I.M.S., Inspector-General of Prisons, Punjab.

Lieutenant-Colonel R. V. Martin, I.M.S., Officiating Inspector-General of Prisons, Bombay.

Lieutenant-Colonel G. T. Burke, I.M.S. (Retd.), lately Secretary, Medical Council of India.

O.B.E.

Miss Louie Brooks, Honorary Secretary, United Kingdom Branch, Lady Dufferin Fund Association.

Khan Bahadur Ahmad Bakhsh, I.S.O., Superintendent, Prince of Wales Hospital, Bhopal, Central India.

Captain P. W. Barnard, Director, Barnard Institute of Radiology, Madras.

M.B.E.

A. C. W. Dessa, I.M.D., X-Ray Department, Irwin Hospital, Delhi.

W. S. Martin, I.M.D., Civil Surgeon, Coonoor, The Nilgiris, Madras.

Rai Bahadur Pitambar Pant, Civil Surgeon, Etawah, United Provinces.

W. P. Todhunter, Officer Supervisor, Office of the Director of Medical Services in India, Army Headquarters.

Kaisar-i-Hind Medal (First Class)

Miss Sarah Janneson Rankin, Medical Officer, St. Margaret's Hospital for Women and Children, Poona City, Bombay.

Mrs. Mary Hilda Youle Remfry (wife of Mr. Justice C. O. Remfry, now retired), Bengal.

Major J. M. Pereira, M.B.E., I.M.D. (Retd.), Superintendent, Patna Medical College Hospital, Bihar.

Mr. H. V. Tilak, Medical Practitioner, Bombay.

Kaisar-i-Hind Medal (Second Class)

Miss Nancy Ethel Bleakly, Medical Superintendent of the Church of England Zenana Mission at Ratanpur, Bengal.

Mrs. Violet Brown, Officiating Matron, Patna Medical College Hospital, Bihar.

Mrs. Primrose Carman, Matron, Thomason Hospital, Agra, United Provinces.

Mrs. Annie Laura [illegible]uremen[illegible]g defect is seen
the Hiranpur Mission [illegible]ating the stomach, duo
Bihar. Often owing to
Miss Madeline Rosa Sh[illegible] t[illegible] is enlarged and
charge, Zenana Mission Ho[illegible]e base remain
Frontier Province.

Mr. Shankar Rao Yado Rao
Secretary of the Red Cross Soci
and Berar Branch, Nagpur.

Rai Sahib Nilmani Pal, Professor
of Wales Medical College, Patna, Ba duodenal
Mr. N. Subramanyam, Medical O niche or
Sholapur Municipality, Bombay.

Kaisar-i-Hind Medal (Third C

Mrs. Florence Mabel Tennent, Nurse, value,
Child Welfare Centre, Royapettah, Madras

Miss Salisabeth Tirki, Doctor-in-charge of by
Dufferin Hospital, Bhagalpur, Bihar.

Mr. B. W. Advani, Honorary Physician, C
pital, Karachi, Sind.

Sardar Sahib Jemadar J. S. Gill, I.M.D.

Mr. P. Joseph, Medical Officer, Afghan
Hospital, Peshawar, North-West Frontier Province.

M. R. Ry. G. S. Rao, Health Inspector, Anti-Ma
Operations, Vizagapatam Agency, Madras.

Rai Bahadur

Mr. R. N. Sewal, Provincial Medical Service, C
Surgeon, Muttra, United Provinces.

Rai Sahib S. K. Sen, Civil Surgeon, Purnea, Bih

Rai Sahib G. C. Das, Honorary Assistant Sur
Imphal, Manipur, Assam.

Rao Bahadur

M. R. Ry. R. A. D. G. Avargal, Retired Civil S
geon, Madras.

M. R. Ry. C. S. G. P. Avergal, Health Of
Corporation of Madras, Madras.

Mr. V. R. Phadke, Principal, Bombay Veteri
College, and Officiating Director of Veterinary Serv
Bombay.

Sardar Sahib

Sardar J. Singh, District Medical Officer of He
Montgomery, Punjab.

Mr. L. Singh, Sub-Assistant Surgeon, First C
Selection Grade, Civil Hospital, Pyu, Burma.

Khan Sahib

Mr. R. A. Shaikh, Bombay Subordinate Me
Service, Officer-in-sub-charge, Civil Hospital, Di
West Khandesh, Bombay.

Mr. K. K. Elahi, Provincial Veterinary Serv
Class I, Professor of Parasitology, Punjab Veteri
College, Lahore, Punjab.

Munshi A. S. Khan, Assistant Civil Surgeon, Pesha
North-West Frontier Province.

Mr. G. Rasool, I.S.O., Superintendent, Medical Br
Headquarters, Peshawar District.

Rai Sahib

Pandit A. D. Bhandari, Provincial Subordin
Medical Service, In sub-charge, Balrampur Hosp
Lucknow, United Provinces.

Lala G. Kapur, Vice-Principal and Lecturer
Pharmacology and Therapeutics, Medical Sch
Amritsar, Punjab.

Babu Shashi Bhushan Dutta, Civil Surgeon, Bhagal
Bihar.

Babu Nilendra Nath Chatterji, Assistant Me
Officer, South Bihar Sugar Mills, Ltd., Bihta, P
District, Bihar.

Babu Radha Prasanna Ghosh, Private Medical Pra
tioner, Samastipur, Bihar.

Babu Kashinath Misra, Teacher of Surgery, Ori
Medical School, and Deputy Superintendent, Cut
General Hospital, Orissa.

Rao Sahib

M. R. Ry. C. N. V. R. Avergal, District He
Officer, Madras.

M. R. Ry. K. G. M. Avergal, Sub-Assistant Surg
(Retd.), Madras.

Mr. C. G. Antani, Subordinate Medical Serv
West Hospital, Rajkot, States of Western India.

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grafting and other reconstructive
There are minimum scars,
saving of lives that would

Air Warfare and
By L. H. G.
(From the *Practitio*

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Ovarian Insufficiency definitely compensated by PROGYNON

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Progynon-B oleosum forte
50.000 Int. Benz. Units

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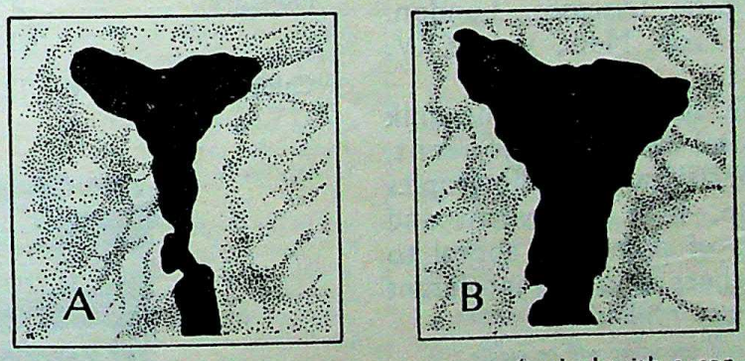

The radiographs show a hypoplastic uterus (packed with a contrast medium).

A Before treatment. **B** After application of 5 injections of Progynon-B oleosum forte, over a period of 3 weeks. The uterus has doubled its original size

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Coeliac Disease

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Proteins	34·0	4·2
Lactose	45·0	5·6
Mineral Salts ...	7·4	0·9
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	100·0	100·0
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grafting and other reconstructive QUIREMENTS OF
There are minimum scars, UGS IN 1938
saving of lives that would

— the supervisory body under

Air Warfare and

By L. H. C. been published by the League

(From the *Practitio*

gives provision for the dangerous

In air warfare of every country and territory in practitioner and cal number of separate administrative every section of ries, colonies, dependencies, protec- have certain sec or which estimates are given in the him in his tre 179. In preparing its statement, the tions for the body had to examine estimates for The practice and 104 territories. In addition, in accord-

(1) A the obligation imposed upon it under the air warfare, it established estimates for ten countries aircraft or territories, for which estimates had not been

(2) ed by the Governments concerned.

stance, publication of this statement comes in the fifth on the the existence of the supervisory body, which

(3) the opportunity during its two sessions this year pro reviewing the working of the system of estimates of international control created by the Drugs the Limitation Convention. Four years' practical experience of this system has proved its efficiency. A close co-operation has been built up with practically every Government in the world. In this field of its technical work the League has realized in a very complete measure the principle of universality.

In order to carry out the task imposed by the Convention of securing universal application, the supervisory body has endeavoured from the outset to elaborate principles and procedures capable of being applied with the same degree of efficiency not only in large industrialized States with an elaborate administrative machinery, but also in small countries and territories—even including small islands like those of the Pacific with a few thousand inhabitants and a rudimentary legislative and administrative organization corresponding to their simple needs. A further interesting advance towards this goal has just been made by the supervisory body. It has drawn up a pamphlet of some twenty pages entitled 'Notes on the Preparation of Estimates'. These notes fall into two parts: (1) notes for non-manufacturing countries which merely import their requirements, and (2) notes for manufacturing countries. The notes are in the nature of a guide which brings together for the convenience of the national administrations in a practical form the experience gained during the four years of the working of the Convention.

The increasing universality of the application of the Convention is shown in part by the record number of 63 ratifications which it has received—a figure higher than that obtained by any other Convention under the auspices of the League. It is also shown by the constantly increasing number of countries which, each year, furnish estimates, and the corresponding decrease in the number of estimates which the supervisory body is itself called upon to establish. In October 1933 only 45 countries furnished estimates. This figure rose steadily to 54 in 1934, 59 in 1935, 61 in 1936, and 63 in 1937. In the same way, the number of estimates furnished for territories rose from 83 in 1933 to 104 in 1937. The corresponding decrease in the number of estimates framed by the supervisory body itself is from 54 (23 countries and 31 territories) in 1933 to 12 (10 countries and 2 territories) in 1937.

A further sign of progress is the constantly increasing exactitude of the estimates furnished by Governments. The gap between the estimates furnished in advance and the statistics subsequently received of the actual trade operations covered by these estimates narrows from year to year.

It is nevertheless impossible to foresee all needs for each drug with complete accuracy in advance, and it is one of the tasks of the supervisory body under the Convention to examine supplementary estimates which Governments find it necessary to furnish during the course of the year. Since the publication in November last year of the statement of estimates for the year 1937, the supervisory body has received and examined 118 supplementary estimates relating to the current year.

As regards the figures of drug requirements for the year 1938 contained in the statement, the following may be noted. The introductory table in the statement gives a total of estimated world requirements of each drug for medical and scientific purposes for the year. The total amount of morphine required for all purposes (including the amount required for conversion into heroin, codeine and dionine) is 45,638 kilos (as compared with 40,976 kilos in 1937). The amounts of heroin, codeine and dionine (made principally by conversion from morphine) estimated as required for 1938 are: heroin, 1,133 kilos (as compared with 965 kilos in 1937); codeine, 29,921 kilos (as compared with 25,724 kilos in 1937); dionine, 3,089 kilos (as compared with 3,199 kilos in 1937). The amount of cocaine estimated as required is 5,032 kilos (as compared with 4,976 in 1937). A little over a ton of other drugs is required. Altogether, therefore, leaving aside the factor of conversion, the total amount of dangerous drugs estimated as required for actual use next year is a little over 52 tons.

One of the principal tasks of the supervisory body under the Convention is to see that estimates are not excessive and correspond as closely as possible to real needs. In carrying out this task, the supervisory body asked for additional information and explanations in the case of eleven countries. Even here, four years' experience has shown considerable progress, since information of this kind was asked for in 1934 from 28 countries, in 1935 from 23 countries, and in 1936 from 18 countries.

Some 53 countries have so far signed the Procès-Verbal drawn up for the purpose of enabling the statement of the supervisory body to be issued on 1st December instead of 1st November; ten signatures are still required before the Procès-Verbal can come into force.

LEAGUE OF NATIONS,
INFORMATION SECTION.

16*th December*, 1937.

BOMBAY MEDICAL COUNCIL

THE following extracts from a summary of the proceedings of the meeting of the Bombay Medical Council held on 8th November, 1937, are published for information:—

The council proceeded to consider the position with regard to the (1) resolution passed by them at their February 1937 meeting that the Medical Council of India be urged that the Government of Portuguese India be requested to allow all medical practitioners registered under the Bombay Medical Act, 1912, to practise in Portuguese India and (2) the reply from the Medical Council of India that the matter is outside their scope and that any extension of local reciprocity should be negotiated for, by and at the discretion of the Bombay Medical Council and it was decided that the matter be referred back to the executive committee to consider and report on the question of advisability of further urging the Government of Portuguese India to allow all medical practitioners registered under the Bombay Medical Act, 1912, to practise in Portuguese India.

The council proceeded to consider the application of Dr. Hermann Selzer, M.D. (U. Rome), for registration under section 7(1) or 7(1a) of the Bombay Medical Act, 1912, and resolved that the matter be referred back to the executive committee (*i*) for stating the conditions under which tables (G) and (H) in the Bombay Medical Register showing the qualifications registrable as additional qualifications were drawn up and (*ii*) for finding out the names of the institutes in the Kingdom of Italy referred to in government notification, General Department, No. 6675, dated 12th October, 1937.

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The council proceeded to consider the charge of giving a false certificate of death and consequently being guilty of infamous conduct in a professional respect against Mr. Dattatraya Sadashiv Pathre, M.B., B.S., and decided that he has been guilty of the charge and directed the registrar to erase his name from the Bombay Medical Register.

The council proceeded to consider further the application of Mr. G. S. Kasyapi, L.M. & S., for the restoration of his name to the Bombay Medical Register and resolved that the consideration of the application be postponed to the next meeting of the council and that he be asked to be present at that meeting.

The council proceeded to consider the proposal of the Government of Sind, forwarded by the Government of Bombay for opinion, that one out of the six seats of nominated members under clause (*b*) and two out of the six elective seats under clauses (*c*) and (*d*) of sub-section (2) of section 2 of the Bombay Medical Act, 1912, be reserved for Sind, and it was resolved by a majority that the present arrangement may continue until a separate council is formed for Sind.

The council proceeded to consider the proposal made by the executive committee that the Legal Department of the Government of India be requested to include in the new Insurance Bill a provision that insurance companies should employ only registered medical practitioners as medical examiners and referees and it was resolved that the Bombay Government be requested to represent the matter to the Government of India, that the president be authorized to write a memorandum making out a case for the employment of registered medical practitioners only as medical examiners and referees by insurance companies and that a copy of each of the resolution and the memorandum be sent to each Provincial Medical Council for such action as it deems proper and with a request that immediate effect be given to it.

The council proceeded to consider the position with regard to the resolution adopted by the Medical Council of India with reference to the correspondence regarding the question of recognition for registration of medical qualifications of the American universities, *viz,* 'that this council is of opinion that Indian nationals who have obtained qualifications of repute in foreign countries should not be granted recognition in India unless such foreign countries recognize the qualifications of this country on a basis of complete reciprocity', and it was resolved that the Bombay Medical Council agrees with the above resolution, subject to the proviso that the restriction embodied in that resolution should not be operative till the end of 1942 so far as the Indian nationals are concerned.

The council proceeded to consider the letters from the chairman of the Provincial Branch of British Empire Leprosy Relief Association (Indian Council) and the Government of Bombay, requesting, in accordance with the revised constitution of the branch, that a member be elected to represent the council on the provincial branch and Mrs. Cecilia D'Monte, L.M. & S., F.C.P.S., was accordingly elected as the representative of the council on the branch.

The council proceeded to consider and passed a motion made by Dr. Jivraj N. Mehta, M.D. (Lond.), etc., and seconded by Mr. C. A. Amesur, M.S. (Lond.), that the executive committee be requested to submit amendments to clause (7) of rule 12 of the rules of council regulating elections to the council so as to ensure secrecy of the ballot.

The council proceeded to consider and passed a motion made by Mr. U. B. Narayanrao, L.C.P.S., and seconded by Mr. V. D. Sathaye, L.C.P.S., that the proposal of the former, for amending (*i*) section 2 of the Bombay Medical Act, 1912, so as to fix the number of members of the council at 14, to provide for the election of the president annually, to reduce the number of nominated members from 6 to 4 and to increase the number of members elected under clause (*d*) from 2 to 5 and (*ii*) section 5 so as to omit the word 'previous' from clauses (1) and (2) of it, be referred to the executive committee in the first instance.

The council proceeded to consider the amendments made by Mr. V. D. Sathaye, L.C.P.S., and seconded by Mr. U. B. Narayanrao, L.C.P.S., that the council is of opinion that the practice of [illegible] medical certificates granted by practitioners is against the principles of the Bombay Medical Act, VI of 19[illegible] recommends to Government to [illegible] practice and it was further resolved that [illegible] be requested to take the matter up with the Minister and press for the acceptance of this view.

The council proceeded to consider a [illegible] the conferment of unauthorized medical [illegible] and assumption thereof' received from [illegible] for the opinion of the council and it was resolved (1) that the council is in favour of the bill practically on the lines of the bill to amend the Medical Degrees Act, 1916, previously submitted to Government by the council, and will communicate its views later regarding the details of the bill and (2) that the matter be referred to the executive committee for consideration and report.

The council proceeded to consider a motion made by Dr. Jivraj N. Mehta, M.D. (Lond.), etc., and seconded by Mr. C. A. Amesur, M.S. (Lond.), that the words 'under the Medical Acts or' in line 3 of clause (1) and in line 3 of clause (2) of section 10 and in line [illegible] of section 11 of the Bombay Medical Act, 1912, be deleted and that the words 'if reciprocity of registration has been arranged with the General Medical Council, London', be added between the words 'shall' and 'be' in line 2 of clause (1) of section 7, and it was resolved that the matter be referred to the executive committee in the first instance.

The council proceeded to consider a motion made by Dr. Jivraj N. Mehta, M.D. (Lond.), etc., and seconded by Dr. P. T. Patel, M.D. (Lond.), etc., suggesting (1) that the Bombay Telephone Company be requested to make certain alterations in their telephone directory, e.g., giving separate lists of 'Veterinary Surgeons' and 'Dental Surgeons', (2) including in the special list of 'Doctors' only those who hold medical degrees or diplomas, irrespective of the fact whether they are registered or not, and (3) showing the medical qualifications properly, etc., and it was resolved that the matter be referred to the executive committee for consideration and report and that the committee be requested at the same time to go into the question whether any action could be taken under the Indian Medical Degrees Act, 1916, against any of the practitioners mentioned in the directory.

INDIAN MEDICAL COUNCIL

COLONEL N. M. WILSON, Surgeon-General with the Government of Madras, has been nominated as a member of the Medical Council of India from the Presidency of Madras.

THE UNITED PROVINCES PHARMACEUTICAL ASSOCIATION

THE Annual General Meeting of the U. P. Pharmaceutical Association was held in the department of pharmaceutics, Benares Hindu University, on the 14th November, 1937. After the acceptance of the annual report and audited statement of the accounts the office bearers of the council of the association for the year 1938 were elected.

The U. P. Pharmaceutical Association has been recently registered under the Societies Registration Act of 1860 and has the following aims and objects:—

(*a*) To train men for the profession of pharmacy in the United Provinces who will be at par with those in other civilized countries and to devise ways and means for the attainment of this ideal.

(*b*) To promote the cause of the science and art of pharmacy in all their different branches.

(*c*) To raise the status, outlook and ethics of those who are directly or indirectly engaged in pharmaceutics

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FEB 1938

grafting and other reconstructive ...oing in the association the province. There are minimum scars, ... matters of interest affecting saving of lives that would ... — ...ssion of pharmacy by sending ...rwise to various bodies dealing much matters.

Air Warfare and

By L. H. C... ...aminations under the association (From the *Practitio...* ...s and diplomas to properly qualified ...g

IF air war should ...ish a laboratory for the investigation of practitioner and ...s with a view to incorporating the useful every section o... ...lian pharmacopœia when it is published. have certain s... ...edit and publish journals, books, magazines, him in his t... ...e and other publications for promoting the tions for the ... ...pharmacy in India.

The ... ...ordinary membership of the association will be (1) A... ...s those persons who hold the following qualifica- air warfa... ...- aircraft ... Persons who are graduates in pharmacy or (2) ...naceutical chemistry of any university or college stance ...gnized by the association. on th... (3) ...) Persons who are registered practitioners of ...edicine or surgery. pro... (c) Persons who have worked for at least five years of ... in some dispensary or hospital subsequent to the passing th... ...of an examination for the certificate of a compounder ... or dispensing chemist.

(*d*) Persons who have passed any other examination requiring at least two years' training in pharmacy and pharmaceutical chemistry subsequent to the matriculation examination or an equivalent examination held by any university or board of high school and intermediate examination of the United Provinces.

(*e*) Persons who have passed any of the examinations of this association.

(*f*) Persons who have been engaged in any manufacturing pharmaceutical laboratory for at least five years subsequent to their graduation from a university.

(*g*) Persons who have been engaged in teaching pharmaceutical subjects, including chemistry.

BRITISH ASSOCIATION OF RADIOLOGISTS

FELLOWSHIP EXAMINATION

OF the nine candidates who sat the examination for the Fellowship of the Association, held at the beginning of December 1937, the following have satisfied the Fellowship Board:—

F. Ellis, M.B., Ch.B. (Sheffield), D.M.R., R.C.P. & S. (Honours in Radiotherapeutics).

R. McWhirter, M.B. (Glasgow), F.R.C.S. (Edinburgh), D.M.R.E. (Cambridge) (Honours in Radiodiagnosis and Radiotherapeutics).

E. L. Rubin, M.D. (Liverpool), D.M.R.E. (Liverpool) (Honours in Radiodiagnosis).

M. C. Tod, M.B., F.R.C.S. (Edinburgh), D.R. (Edinburgh) (Honours in Radiotherapeutics).

J. Z. Walker, M.B., Ch.B. (Glasgow), D.M.R.E. (Cambridge) (Honours in Radiodiagnosis).

THE ALL-INDIA POPULATION AND FAMILY HYGIENE CONFERENCE

THIS conference will be held at Bombay from the 16th to 19th April, 1938 (Easter holidays), and not in January as originally announced; members and delegates wishing to submit papers and attend the sessions should write early to the Honorary Secretaries at No. 8, Ormiston Road, Apollo Bunder, Bombay.

2ND ALL-INDIA OBSTETRIC AND GYNÆCOLOGICAL CONGRESS, BOMBAY

THE 2nd All-India Obstetric Gynæcological Congress will be held at Bombay from the 13th April to 16th April, 1938, under the Presidentship of Dr. B. D. Mukherji, of the Carmichael Medical College, Calcutta. Those who desire to attend the Congress should communicate to the Organizing Secretary, Raj Bhuvan, Sandhurst Road, Bombay 4.

A Medical Exhibition is also arranged. Those manufacturers who desire to reserve a stall, should inform the Honorary Secretary as soon as possible.

Current Topics

The Rationale of the Tannic Acid-Silver Nitrate Treatment of Burns

By A. G. BETTMAN, M.D.

(From the *Journal of the American Medical Association*, Vol. CVIII, 1st May, 1937, p. 1490)

A NEW conception of burns has been brought about as a result of their treatment by the tannic acid-silver nitrate method. This treatment appears to change the lesion into one comparable to a surgical wound. It is this induced change, by the application of tannic acid and silver nitrate, that makes it superior to any other procedure from many different points of view:

1. The saving of lives that would be lost through the slower method of tanning.
2. The immediate stopping of the loss of body fluids, thereby preventing the consequent concentration of the blood.
3. The immediate prevention or very definite minimizing of shock.
4. The immediate prevention of the absorption of toxic products.
5. The prevention of infection by the short period of application of moisture and the early drying of the tanned tissues.
6. The saving of the kidneys and other organs from the effects of fluid concentration and the absorption of toxins and infection.
7. The greater comfort of the patient.
8. The fact that the patient is carried safely past the first twenty-four hours, the most critical period following a serious burn.
9. The fact that the patient avoids the second critical period, that of infection and late absorption of toxic products.
10. The simplification of the nursing problem, especially in the first twenty-four hours.
11. The prevention of further breaking down of tissues, resulting from long application of wet dressings.
12. The prevention of chilling, resulting from the long application of cold, wet dressings.
13. The formation of a thin, flexible coagulum.
14. The speedy healing of the burned areas with a shortened period of hospitalization.
15. The prevention or minimizing of heavy contracting scars by early rapid healing in the absence of infection.
16. The lessening of the amount of skin grafting and secondary corrective surgery.

In July 1934 I used the tannic acid and silver nitrate method for the first time on an extensive burn, the seventh burn on which it was used, although I had for many years used the same agents for the removal of tattooing. The result was the spectacular recovery of a doomed man. Previous presentations have dealt solely with the details of the application of the treatment. The present paper is a consideration of its rationale.

A burn lesion is not the burn alone but the burn *plus* all those consequences which develop because the treatment does not check them. The outcome of the treatment has in the past too often been considered as an unavoidable part of the original condition. Accordingly the treatment of serious burns has been approached with dread by physicians because of the limited benefits accruing from their management.

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When tannic acid is applied to a burn and is followed by silver nitrate, a coagulum speedily forms which becomes impermeable to the further loss of body fluids and which immediately prevents additional fluid shifts. Through its speed alone in producing this change, it saves lives. This treatment by preventing dehydration minimizes shock and thereby carries the patient safely through the most critical period; that is, the first twenty-four hours following a serious burn. It therefore lessens one of the most fatal untoward effects of a burn.

A burn, however produced, results in injury to, or destruction of, the skin to a greater or lesser depth, frequently extending into the subjacent tissues. This injury to the outer protecting layer of the body quickly results in the formation of large or small vesicles, which may remain intact or which may become ruptured and ooze for a long time. Following a burn there begins at once the outpouring from the surface of the body of a great quantity of fluid. The loss of the outer layers of skin, those which act as a seal, allows this to take place unhindered. The serum loss rapidly reduces the amount of all body fluids. The removal of the protective layers of the skin alone by any means, including burns, results in a copious outflowing of serum. Such weeping outlets must be sealed at once to prevent dehydration.

In addition to the surface escape of fluid there is produced very early a reaction which calls for the pouring out of circulating body fluids into the tissues adjacent to the thermal injury. This local stagnation of fluids is also very large. Escape of fluid by means of the action of the sweat glands must also be added. These combined losses of circulating body fluids, namely, that which oozes from the body and that which stays in the tissues, are therefore not only voluminous but consequential, since Blalock, Parsons and Phemister, Harkins, Underhill, Kapsinow and Fisk and many other investigators have shown that traumatic shock is the result of the diminution and shift in circulating body fluids.

A brief review of some of the major points brought out by these experimenters is of interest. Animals were fixed on their backs in a trough suspended from above, in such a manner that the apparatus just balanced and was attached to a revolving, recording drum. Severe injury without bleeding was then produced to one side of the animal by burning or beating. Very shortly that side of the apparatus became heavier than the other. This shift of body fluids began promptly. Forty per cent of the maximum shift occurred within the first hour after the injury and continued in a gradually decelerating curve. In the course of these experiments the amount of circulating fluids lost was estimated in various ways: (1) by balancing the overweight of the burned side with weights on the opposite side and (2) by weighing separately the two sides of the animal after death. These authors further showed that the amount of blood obtained by bleeding an animal under an anæsthetic is an index of the circulating blood volume. In control dogs the bleeding volume averaged over 55 per cent of the calculated circulating blood volume. In shock due to severe trauma of the extremities, whether caused by a burn or otherwise, it was reduced to as much as 16 per cent. The shift from the circulating blood stream to and about the injured tissues consisted therefore of a very large percentage of the circulating blood volume. The figures representing the circulating fluid loss were further substantiated by excising sections of muscle from the injured and the uninjured side, weighing them and then evaporating them to dryness, and also by expressing the fluids under pressure. The same figures were obtained. These determinations were still further checked by frequent hæmoglobin estimations and hæmocrit readings and were compared with control animals similarly anæsthetized but otherwise uninjured.

The average loss of circulating body fluids following a severe burn was found to be 2.1 per cent of the total body-weight. As dogs do not blister and weep, this loss was solely into and a[illegible] was out of the circulation thremen[illegible] The deprivation of a large v[illegible] fluids is therefore shown to b[illegible] shock, which will become mar[illegible] reaches a certain low point. He[illegible] may increase it. Other experime[illegible] shows that the blood pressure holds shortly before death. It falls only output is reduced, when shock superve[illegible] pressure is therefore not a reliable criter[illegible] dition of the burned patient. Hæmoglob[illegible] tions, on the other hand, give much [illegible] information and should be made frequently. that escaped into subcutaneous tissues after [illegible] mental burn showed some chloride increase [illegible] fluid portion of the blood. Sugar and non nitrogen were not changed, and the protein conte[illegible] somewhat lower. It very closely resembled [illegible] plasma.

It follows, then, that when a part is burned otherwise injured there is produced in and about [illegible] area an altered physiology. A call goes forth th[illegible] results in a rapid and great seeping of fluids into, an[illegible] adjacent to, the injured area. A considerable fluid los[illegible] thereby is rapidly attained. However, when such [illegible] traumatized region is treated at once by the applicatio[illegible] of tannic acid followed by silver nitrate, all the destroyed and injured tissues down to the very borderline of impaired cells are picked up and fixed in an innocuous, non-absorbable coagulum.

The shift of the circulating body fluids into the tissues adjacent is halted at once. The necessity for prompt and complete stoppage of all fluid losses is imperative. A treatment that requires more than an hour in which to seal up the leaking surfaces and to control the fluid shift is therefore to a high degree inefficient. Tannic acid and silver nitrate applications which act instantly are therefore most efficient. The practical importance of speed in the initial treatment of burns is manifest when it is recalled that 60 per cent of the deaths from burns occur in the first twenty-four hours, nearly all from traumatic shock.

What are the practical applications of the foregoing facts to a man of say 155 pounds (70 kg.)? The calculated blood volume, being one-thirteenth of the body-weight, is therefore 12 pounds (5.4 kg.). The total amount of circulating body fluids is about 60 per cent of the calculated blood volume, or 7.2 pounds (3,266 gm.). The loss of 2.1 per cent of the total body-weight therefore would be 3¼ pounds (1,474 gm.). Thus is lost between 40 and 50 per cent or even a greater amount of the entire fluid portion of the blood. It was also determined by comparison with experimental animals that a burn of one-sixth of the body surface of a 150 pounds (68 kg.) man may cause a loss of 3,500 c.c. or 70 per cent, a staggering amount, of the circulating body fluids in the first twenty-four hours.

The efforts of nature to overcome an injury by dilution of the obnoxious agent call for the outpouring of fluid into the surrounding and adjacent tissues. This produces œdema of the intercellular spaces and widespread swelling. When tannic acid and silver nitrate are applied, the seal they provide exerts an influence that is beneficial beyond anticipation. The changes in the surface come with great promptitude. What was but a moment ago a red, wet, oozing, irritated surface is now covered with a black, smooth, dry, leatherized eschar, soft and flexible, yet firmly attached and acting as a protection from injury from without, as well as being an occlusant against the loss of fluids from within. The usual widespread and important systemic effects of the burn are not noted. Untoward reactions are absent and the picture is entirely different from that seen when other treatments are used.

With this treatment, the temperature usually does not rise above 101°F. even in extensive burns, and the pulse and respiratory rates are proportionately low. The red blood cell counts remain remarkably near normal, as do also the white cell counts. Only a few staff cells are present.

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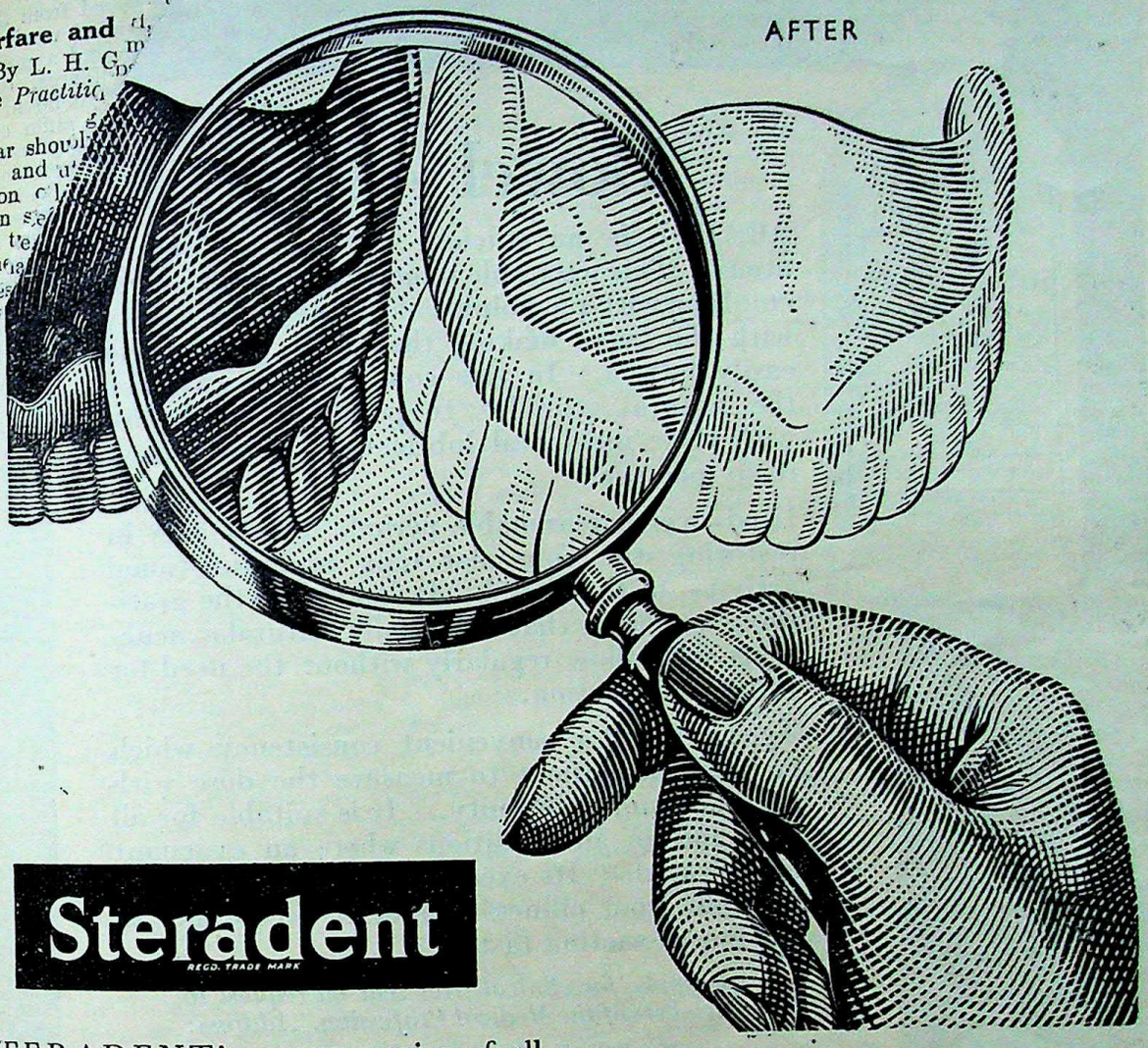

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grafting and other reconstructiv at kidney damage occurs
There are minimum scars, as it may be taken as a part
saving of lives that would ens and not be classed as a
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Air Warfare and d, urinary suppression has never
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By L. H. G bsence of grease or oil applications,

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(2) is, therefore, results in the escape of increased
stance nts of fluids into the intercellular spaces. These
on the es, becoming engorged, produce a very considerable
(3) argement of the extremity. This takes place when
pro example wet packs are applied as to a hand.
of however when tannic acid and silver nitrate are applied,
the period of the application being but a few minutes at
c most, there is not time for the dilatation of vessels,
for the outpouring of fluids from the circulation, for
the absorption of fluids from the surface or for weeping.

Substances such as may be present as a result of the tissue destruction and which may produce local reactions causing intercellular œdema are grasped and held at once permanently in an insoluble, non-absorbable, irreversible matrix. There are therefore no irritating substances beneath the coagulum to call out a reactive response. There is no outpouring of fluid, no oozing, no overfilling of the intercellular spaces, no œdema, no enlargement of the extremities and no increase of pressure within the coagulum. There are no toxins or other deleterious substances to be absorbed.

In practically all burns there remain unimpaired many epithelial islands of skin and of the deep glands. The long application of any solution breaks down many or all of these. Tannic acid and silver nitrate save these centres of epithelization, and speedy healing with lessened scar tissue is therefore promoted.

By the use of tannic acid and silver nitrate, there being no fluid on the surface for long periods and the casing formed being dry, non-absorbable and of a composition which is not a good culture medium, infection is prevented. The wound is dry and clean from the onset and is kept so throughout.

Contrariwise, when grease or oil in any form has been applied, whether as the burning agent or as the treatment, even though complete removal is attempted, there will remain areas which are not as dry as when grease has not been applied. Grease and oil applications should never be made to any burn.

When slow acting coagulating applications are made there is much œdema, which progressively increases the tension of the tissues within the slowly forming casing. The application of tannic acid followed by silver nitrate produces as eschar under which there is little or no increased tension. An objection to the use of tannic acid alone is the loss of digits, which sometimes occurs. The marked difference in the tannic acid alone and the tannic acid-silver nitrate treatment in this regard is distinctly shown in the cases to be cited:

Case 1.—Baby C., aged 5 months, received a burn of the entire right upper extremity, the chest and the face. The tannic acid-silver nitrate treatment had not yet been used on extensive burns and was used only on the chest. Tannic acid alone was used on the extremity and the face, according to established technique. The leatherization took place over a period of some hours, with another period for drying. During the time that the coagulum was forming an outpouring of serum from the surface as well as into the subcutaneous and deep tissues was taking place, as was also some absorption of fluid from the surface. These actions continued concurrently with the formation of the leatherized encasement, and the extremity became confined within a slowly forming but nevertheless firm case. The œdema progressively increased and the pressure within the casing increased with it and finally became sufficiently great so that the venous return flow was impeded, as was also the arterial circulation. The hand sloughed off at the wrist just below the point at which the circulation was superficial and therefore most easily compressed.

Case 2.—R. B., a man, aged 45, received a 54 per cent (by actual measurement) gasoline burn extending from the top of his head to his right ankle. He was seen shortly after patient 1. So seriously burned was he that three physicians told him that his condition was hopeless. The burn of the hand and arm was more severe than that of the child, and his general condition was also very much worse. When I saw him four hours after the accident a considerable loss of circulating body fluids had already taken place. The hæmoglobin was 165 per cent of normal and the red blood count showed concentration in proportion. Tannic acid was applied from head to foot, followed by silver nitrate. The oozing was stopped almost instantaneously and within a few minutes the surface was dry and there was no further increase of the dehydration. Albumin was never present in the urine. The outpouring of serum into the adjacent tissues was also stopped with promptitude. Encasement of more than half of the body surface, including the entire right arm and forearm, both wrists and hands and right leg and thigh, head, back and other parts, was quickly accomplished. A firm, dry, thin, leather-like covering was formed. The blood vessels of the wrists and elsewhere were not impinged on and the circulation of the burned extremities was not interfered with. There was little or no increase of pressure within the casings. The passage of but a few days showed that both hands with all fingers would be saved intact. He was all healed and well by the forty-second day and to-day has no impairment of function of the fingers and hands and no scarring anywhere except on the back of the right hand and forearm, where Thiersch grafts were applied on the twenty-sixth day.

The contrast of these two cases is very vivid. Not only was this life saved by the prompt action of the medicaments but his hands also by the absence of undue pressure within the rigid encasement which covered the extremities like a glove. It is not intended to convey the idea that digits may never be lost under this treatment, but they are not lost because of œdema within the coagulum.

Three cultures taken from beneath unbroken tanned and dry coagulum on two seriously burned patients showed no growth of organisms, but cultures taken from uncovered areas showed *Staphylococcus albus*. The dry surface of treated areas is not a good culture medium for bacteria, and this condition is augmented by the antiseptic action of the silver present in the coagulum. From early periods silver, both in the metal and in the salts, has had wide usage for the prevention of infection in wounds, and surely it is here applied to a maximum effect.

That no absorption of silver takes place even when extremely large amounts of solution are used is proved by the fact that in none of the many cases treated has argyria or other evidences of silver absorption been seen, although carefully watched for. It has not been noted by other surgeons who have reported experience with this treatment.

Patients treated with tannic acid followed by silver nitrate are remarkably comfortable at once. Many patients are ambulatory from the beginning or at a very early date, frequently even when portions of the lower extremities or the torso are the sites of injury. Even in very extensive burns, patients move about quite freely in bed. The extreme systemic effects of the burn are greatly extenuated. Irrational periods are present only in very large burns and are of short duration.

A serious burn affects all the vital organs unless stopped by efficient treatment. When dehydration occurs, it lowers the heart output and makes difficult the carrying on of the vital processes by the blood cells

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operating in deficient fluids with increased viscosity and resulting anoxemia. The lessened aeration of the blood is the effect of the difficulty in taking on oxygen and giving off carbon dioxide and other waste products. Toxic substances are excreted with difficulty and incompletely. The blood chemistry particularly is changed. The absorption of degenerated tissue and bacterial toxins modifies the action of all the organs and tissues within the body. It is proposed to discuss the blood chemistry phase of this treatment at another time. These untoward effects are not seen when the burn is early treated with tannic acid and silver nitrate as directed.

The treatment of burns with tannic acid alone has proved far superior to greases and oils and other applications. While the use of tannic acid alone, as brought out by Davidson, is a decided advance over applications of grease and oil, yet it is not comparable to the tannic acid-silver nitrate method. The tannic acid alone and the dye treatments act in hours. Tannic acid followed by silver nitrate controls the condition in minutes. As stated earlier, red blood cells and albumin do not occur in the urine of patients under the tannic acid-silver nitrate regimen in the absence of applications of grease or oil; but when these applications have been made there is always albumin in the urine, even though an attempt has been made to remove them.

In the latter case the deficiency in the stoppage of the fluid loss through weeping and œdema is but slightly less than when grease has not been applied, not sufficient to make an appreciable difference in the concentration of the blood, yet this slight surface moisture is enough to permit the entrance into the blood stream of toxins or other elements that are present on the surface and to allow some infection to develop. The absorption of some substance or substances from the surface must account for the presence of the albumin in the urine.

Concentration of the blood by itself is not sufficient to explain the albuminuria, for it does not appear in other conditions in which dehydration is a marked factor, such as cholera, persistent diarrhœa, severe hæmorrhage and prolonged vomiting. Something other than fluid loss must be responsible for the injury to the kidneys, spleen, liver, adrenals, blood production mechanism and other internal organs. Also, when grease or oil has once been applied the temperature, pulse, respiration, blood counts and the like are increased over what they would have been had such application not been made. The breaking down of protein and the slight infection that develops must account for the presence of substances which are promptly absorbed and which give systemic reactions.

One pictures mentally the terrible painfulness of daily or more frequent dressings of a seriously burned child treated by carron oil or other oil and applications of grease. The infection is always so great beneath the dressings that frequent removals are imperative.

With tannic acid alone the maximum problem of nursing is the often to be repeated applications by swabbing, spraying or packs, with their almost continuous disturbing of the patient. As the coagulum slowly forms the loss of circulating body fluids continues, and this loss must be made up by repeated intravenous, subcutaneous or rectal administrations of fluid, for the stomach retention is usually at a low point at this time.

With tannic acid followed by silver nitrate, one thorough application of the medication and the patient is allowed to rest in his bed warmed by electric lights, being disturbed only once or twice or may be three times for the giving of intravenous fluids. Surprisingly early is the mouth intake and the stomach retention sufficient to meet all requirements. Frequent hæmoglobin estimations are the simple, easy and ever at hand guide that should determine the amount of the fluid intake. Following a serious burn a minimum of 1,000 c.c. of fluids should be given every twenty-four hours for every 25 pounds (11 kg.) of body weight, and this should be more or less equally divided throughout this period.

In the early part of t[illegible]ng defect is seen very liberal proportion of [illegible]the stomach, due but care is necessary, especiall[illegible] Often owing to too large a quantity is not give[illegible] is enlarged and sudden throwing of 500 c.c. of [illegible] is enlarged and stream of a patient weighing say[illegible] base remain and who normally has but 4 pou[illegible] blood, would dilute the circulating [illegible] cent or more.

When the hæmoglobin reading is near[illegible] duodenal should be used in giving extra-alimen[illegible] diplomatic nurse will have no difficulty [illegible]niche or her patient to take the required amount of [illegible] juices and the like by mouth after the ear[illegible] provided it is properly distributed throug[illegible]value, waking period. The necessity for including s[illegible] not be overlooked, and dextrose also.

Instead of the nurse bending her efforts towa[illegible] by production of a good coagulum, she has no concern this feature, as it has already been accomplished by twofold application, and she therefore spends her t[illegible] in keeping the patient warm and the coagulum dry [illegible] in forcing fluids.

By this procedure the coagulum is formed by th[illegible] combination of tannic acid with the body fluids and then by a union of the silver nitrate with this first combination. The application of tannic acid produces a greyish-white precipitate, which instantly becomes black when in contact with the silver nitrate. Metallic silver is precipitated into the mass, where it is fixed. Any heavy metal would undoubtedly act in much the same way if used when silver nitrate is not available, but the good offices of the silver would be lacking.

Burns treated with oil and grease heal slowly, become infected, form abundant scar tissue and have a long and trying period of hospitalization. The treatment by tannic acid followed by silver nitrate, in the absence of oil and grease, promotes smooth healing. There is little or no infection beneath the coagulum, there is minimum scarring and a short period of hospitalization, frequently none at all, and there are no dressings to be changed. Many patients are entirely healed beneath the coagulum when it comes away.

Our records show that the hospital confinement period has been reduced to one-fourth the time by this treatment. In other words, it takes only weeks now for recovery whereas under former treatments months were required.

The tannic acid-silver nitrate treatment of a burn is carried out as follows: The patient is given a narcotic, which is repeated as often as may be necessary for comfort. Fluids must be forced throughout. Grease and oil in any form should not be used. If such an application, unfortunately, has been made, it must be removed with ether, benzene or ethyl acetate before treatment is applied. All blebs are to be opened and all loose skin and other burned tissues are to be removed. A thorough application of fresh 5 per cent tannic acid solution is made by means of cotton swabs. Following this, 10 per cent silver nitrate solution is applied in the same manner.

The local treatment now being completed, the patient is placed in a tent heated by electric light bulbs and the burned areas are dried and kept dry. In a few days the coagulum begins to loosen and is removed as early as possible. When it comes away, large areas and not infrequently all the burned surfaces will be found to be entirely healed. Occasionally moisture will be hidden beneath crusts where drying has not been satisfactorily accomplished, and such areas are unhealed. When the coagulum is adherent but loose, it is removed, a scalpel being used if necessary. Unhealed areas are treated by the application of oxyquinoline sulphate scarlet R gauze, in a single layer over which a light pad of dry gauze is placed, and healing is greatly speeded up.

The schedule here outlined—the avoidance of grease and oil, the giving of a narcotic, the application of tannic acid followed by silver nitrate, drying the coagulum, keeping it dry and removing it early, forcing fluids and the stimulation of epithelization—constitutes a superior method of treating serious burns. Less skin

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grafting and other reconstructive measures are required. There are minimum scars, and greatest of all is the saving of lives that would otherwise be lost.

Air Warfare and the General Practitioner

By L. H. GUEST, M.R.C.S., L.R.C.P.

(From the *Practitioner*, Vol. CXXXIX, August 1937, p. 139)

If air war should come to this country, the general practitioner and every practising or active member of every section of the medical profession will need to have certain special and technical information to help him in his treatment of cases and in his recommendations for the prevention of casualties.

The practitioner must have:—

(1) A knowledge of the outline of the methods of air warfare and of the characteristics of modern military aircraft and bombs.

(2) A knowledge of the effects of incendiary substances and poison gases as well as of high explosives on the human body.

(3) A knowledge of the emergency means of protection for individuals given by the different types of respirators, *viz*, the 'General Civilian', as used by the general population, the 'Civilian Duty', as used by certain medical and ambulance services and by key-men and women at special points of importance in public services and the 'Service Respirator', as used by soldiers, the police, special services, A. R. P. doctors and others.

(4) A knowledge of the methods of preventive anti-gas treatment for the avoidance of damage by blister gas.

(5) A knowledge of the methods of decontamination of the clothing of individuals: (*a*) as a preventive measure and (*b*) as a method of cleansing from blister gas.

(6) A knowledge of the methods of decontamination of roadways, houses inside and out, contents of houses, motor cars, public service vehicles and in general all material objects.

(7) A knowledge of the means of constructing gas-proof refuges in private houses, offices, workshops or factories or public buildings.

General considerations

The practitioner will need this information partly for his own use and application in his practice for purposes of treatment should need arise, and partly in order to be able to hand the knowledge on to his patients who will certainly apply to him for information.

It must be emphasized that the question of the propriety and necessity of acquiring this knowledge of air warfare and especially of gas warfare is quite distinct from the question of the nation's policy of peace or war. No one reading the daily newspaper to-day could fail to realize that war is not only a great danger but a definite and terrible practical possibility. How to avoid that war, how to guide the nation's policy into the ways of peace should be a matter of day and night consideration not only for statesmen but of all responsible men and women. But apart from this duty which is incumbent on the individual medical practitioner and on the medical profession as a whole as on every profession, the general practitioner has the special duty of knowing how to treat air raid casualties if they arise and how to use special knowledge to prevent casualties under air raid conditions in so far as it is possible to do so.

In the absence of such knowledge an air raid would lead to panic and to serious panic casualties quite apart from anything an enemy might do. And in this panic an attacked population would be in the situation most exposed to attack and least defended against it. It may be said that the education of the general public cannot be entirely saddled on to the backs of the medical profession and that is true. The Government will issue information to the general public from time to time and the number of lectures given by the Order of St. John, the British Red Cross Society, and the Order of St. Andrew will increase and carry knowledge to an ever-widening audience. A further source of knowledge will be in the nursing profession all of whose members are eventually to receive instruction of the same kind as that given by Home Office medical instructors to medical practitioners. In one way or another, therefore, the amount of knowledge of air attack and of air raid precautions will go on increasing steadily. And the question of treatment of casualties and of methods of avoidance of danger and of prevention of casualties which are very largely medical questions will more and more come to the fore in public discussions, and more and more practitioners will be asked questions about them.

Many questions will be asked to which the medical practitioner will not be able to give a complete reply but it is possible to indicate if not the outline of a complete reply at least the outline of a direction of inquiry. Many people are concerned about the danger of high explosive bombing from the air. The reports from Spain and the story of Guernica in particular have impressed themselves vividly on the popular mind. But an air attack on Guernica, an open undefended town with no defending air force, with no anti-aircraft guns and without air raid precautions of any kind apparently, bears no comparison with a possible air attack on any part of the British Isles. In Great Britain there is an efficient Air Force, efficient anti-aircraft guns and other means of defence and an efficient air raid precautions organization is being built up. Nor is there any direct comparison possible between an attack on a small township as a demonstration of 'frightfulness' and an attack on this country which would have to be aimed at vitally important military objectives. The mere area of London and the industrial area of Birmingham, Lancashire, Yorkshire and other parts of the country make attack difficult. No foreign power has enough aeroplanes to attack more than one comparatively small part of these great areas at a time.

High explosive and incendiary bombs

In reply to a question about high explosives it may, therefore, be said truthfully that the larger part of the country will never be attacked at all and that in areas attacked it will be primarily points of military importance (*e.g.*, docks) which will suffer and houses and flats only incidentally because of their proximity to these points. Incendiary attack by small 2-lb. thermite bombs will be more widespread and may possibly include residential areas but the increased and strengthened fire-fighting services being set up with the aid of the Home Office will attend to that.

Mustard gas

All the gases dealt with so far have been those affecting eyes, nose or lungs. Any one of the three types of respirators, *i.e.*, 'General Civilian', 'Civilian Duty' and 'Service', will give complete protection against them because the rubber face-piece covers the whole face including eyes and nose and the air-filter cleans out the gases from the air before it is breathed in. The tear gases and the lung irritants are absorbed by the granulated charcoal which the respirator filters contain: the nose irritants are filtered out by layers of special wool. The nose-irritant gases, it should be mentioned, are in reality particulate clouds which the layers of special wool filter out. But the next group of gases, the blister gases, not only affect eyes, nose and lungs but also any part of the skin, or of the digestive tract which vapour or liquid can reach.

The respirators, all of them, give complete protection to eyes, nose and mouth and lungs, but the respirator on the face does not, of course, protect the skin of any other part of the body. The effect is one produced by direct contact. It has nothing to do with any absorption from any other part of the body.

The important member of this group is mustard gas, and it was used very extensively in the Great War. It is less deadly than the lung irritants but it has greater casualty-producing power because of its action on the skin. The current phrase describes this effect of mustard gas on the skin as a 'burn' and indeed it is treated as a burn and heals as a burn. But it is not a burn in any ordinary sense. If mustard gas,

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which is liquid normally, is applied to the skin it causes no more sensation than any other liquid of similar properties, say a light motor-engine oil. Only after some hours does erythema, followed by blistering, show itself. The vapour has the same delayed action whether applied to the skin (in the case of clothing being contaminated with drops of the liquid and giving vapour off between clothes and skin) or whether breathed into the lungs, where it produces the same kind of inflammatory destruction. If there is much vapour of mustard gas in the air, the eyes become inflamed as the skin does, but the proportion of serious injuries and partial or complete blindness is uncommon. There is always delay in the onset of symptoms after exposure to mustard liquid or vapour and it is this insidious character which makes it such a potent casualty-producing agent.

Mustard gas is generally a difficult thing to deal with. It is a stable chemical substance, dichlorodiethyl sulphide by name, an oily, dark-coloured liquid in its ordinary commercial form, giving off a vapour at ordinary temperatures, but only evaporating slowly so that if discharged on the ground it persists for a long time and on metal or impermeable stone for weeks. Mustard is also a penetrating substance. It is readily absorbed by everything except metal, glass, porcelain, or a specially prepared surface of oilskin or certain chemical paints. On the skin it is absorbed as readily as is ink by blotting paper because although almost insoluble in water it is readily soluble in the fats of the body. It is also readily dissolved by paraffin, petrol and alcohol. Any food on to which mustard liquid falls or which is exposed to mustard vapour rapidly absorbs it and if eaten subsequently gives rise to the characteristic mustard inflammation of any and every part of the digestive tract which it reaches. There is no immunity to mustard gas, one exposure indeed markedly increases sensitivity and for a period of years, and the poison is also cumulative. Exposure to comparatively small doses of vapour, for example, over a period of a week as under conditions in trench warfare will give rise to skin, throat and eye trouble.

This means shortly that every person exposed to mustard liquid on the skin or clothing or to mustard vapour in sufficient concentration in the air will, if unprotected, become a casualty. And as the mustard liquid is persistent, it will, even if it has soaked into the ground, or into a wood floor or into brick work, continue to give off vapour until the whole of it is slowly evaporated. Mustard gas, therefore, presents the doctor with two major problems: the problem of treatment of affected persons and the problem of prevention of further casualties by removal or destruction of the mustard liquid discharged on to any material object. There is one quality of mustard, however, of which advantage can be taken in treatment. Mustard liquid on the skin is not absorbed at once, it takes about five minutes to penetrate the epidermis. And mustard liquid on the clothing takes about twenty minutes to penetrate it and to produce a poisonous vapour between clothing and body. If, therefore, an individual whose skin is sprinkled with mustard liquid drops can have those drops removed within five minutes or if his clothing has been sprinkled remove the whole of his clothing from top to toe within twenty minutes, then that person will be prevented from developing mustard lesions. But the time is short. There is no space here to go into the question of the diagnosis or detection of mustard, its indefinite smell of garlic or onions or horse-radish, its effect on chemical test paints or of its use in bombs or in the form of a spray from a special spraying tank of an aeroplane, but at a time of air attack it may be assumed with practical certainty that mustard will be used.

Measures must therefore be taken to deal with possible large numbers of mustard gas cases at first-aid posts where 'anti-gas' treatment for individuals, that is removal of mustard from the skin and decontamination treatment for clothing, can be given at once. Quite clearly, however, it will be a great advantage to everyone, in view of the time limit for preventive treatment being so short, if anti-gas treatment (that is, removal of mustard from the skin) and decontamination treatment of clothing can be performed by the individual at home.

Mustard liquid should be removed from the skin by (*i*) dry swabs of cotton-wool applied vertically to the surface, all wiping being avoided and a separate piece of wool being used for each small area, (*ii*) dabbing off areas so cleared of obvious mustard liquid by cotton-wool dipped in surgical spirit (or paraffin or petrol in an emergency) so as to dissolve any mustard not removed by the dry swab and (*iii*) rubbing into the cleansed area a cream (bleach cream) made by mixing bleaching powder and water together in such proportions as produces a creamy application. The swabs used to absorb mustard must be placed in a tin with a tight-fitting lid until they can be burned. The bleach cream should be left in contact with the skin for one minute and then removed by washing off with water. If available, protective ointment, as recommended by the Air Raid Precautions Department, and which will be supplied to first-aid dressers, stretcher-bearers and A. R. P. doctors, can be used instead of bleach cream and must be removed by wiping off with a dry rag. In any case of mustard gas on the skin the eyes should be washed out with plain water as a routine. Any patient with mustard liquid on the skin will also have it on the clothes although there may be cases of persons with contaminated clothing in which the bare skin is not affected. All contaminated clothing must be removed, hat, outer clothes, underclothes and boots or shoes and the whole body washed over with water. If there is any suspicion of penetration of mustard in the skin, bleach cream must be rubbed in and washed off after one minute's application.

The governing consideration is that of time. Anti-gas treatment must be given within five minutes of the mustard reaching the skin. Decontamination treatment must be given within twenty minutes. Contaminated clothing when removed continues to be a source of danger. It should, if possible, be placed in a dustbin-like container with a close-fitting lid. If nothing is available, put it outside in a yard or garden and cover over with other clothes, old blankets or otherwise.

Treatment based on these principles will be given at first-aid posts and decontamination centres, but the more people who understand how to do this for themselves the better for them and the better for all concerned, as congestion at first-aid posts will be avoided.

A Rapid Method for the Direct Estimation of Urea in Urine

By SYDNEY W. COLE, M.A.

(From the *Lancet*, Vol II, 4th September, 1937, p. 57[illegible])

The general use of the blood urea-clearance test for renal efficiency has drawn attention to the desirability of an accurate method for the estimation of urinary urea which can be carried out with simple apparatus and which does not involve the simultaneous estimation of urinary ammonia. From experience gained by noting the work of some hundreds of my pupils during the past four years, I have modified the direct method I published in 1931. It is now conducted much more rapidly and the technique is so simple, that the results obtained are the most accurate of all the quantitative methods of analysis carried out in class work.

Technique

Solutions.—1. N/6 HCl, prepared by diluting 100 ml. of N.HCl with 500 ml. of distilled water.

2. Acid potassium phosphate, KH_2PO_4, 3 per cent.

3. Brom-thymol-blue, 0.04 per cent.

4. 'Mixed Indicator'. Mix equal volumes of 0.02 per cent solution of methyl-red in 60 per cent alcohol and of 0.04 per cent aqueous solution of bromcresol green. The indicators are conveniently stored in bottles carrying dropping pipettes. The 'mixed indicator' should be freshly prepared about every two months, the methyl-red being somewhat unstable in the mixture.

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5. Dilute caustic soda (about 0.1 N) in a bottle fitted with a dropping pipette.

6. Mercuric-ammonium chloride. Dissolve 0.5 g. of mercuric chloride in 250 ml. of distilled water. Add 250 ml. of a cold saturated solution of pure ammonium chloride. The solution should be stored in a bottle fitted with a cork carrying a 1 ml. pipette that has a safety bulb above the mark. It should be labelled *Poison.*

7. Urease. Transfer 5 g. of powdered jack bean meal to a 150 ml. flask, with a narrow neck that can be sealed with the thumb. To 10 ml. of the acid potassium phosphate add 90 ml. of distilled water. Pour this on to the meal. Seal with the thumb and shake vigorously for a minute. Filter through a pleated filter paper. The first 10 ml. generally come through cloudy and should be refiltered. The urease solution should be kept in a refrigerator when not in use. When thus stored it is sufficiently active after a month, but it is advisable to prepare extracts every week.

Apparatus.—A 5 ml. micro-burette (A) and a 2 ml. micro-burette (B). These are filled to the mark with the N/6 HCl. The two burettes are conveniently clamped in a double Fisher burette-holder.

A 1 ml. pipette for the urine. It is advisable to use an Ostwald pipette, calibrated for delivery by blowing out after drainage.

A 5 ml. pipette for the urease.

A can of water at 40° to 45°C.

Boiling tubes, 6 by 1 inch.

Method.—Label two similar (in diameter) boiling tubes A and B. Into each measure 1 ml. of the urine, and to each add 3 drops of brom-thymol-blue.

To A add 5 ml. of the urease and warm gently in a flame. As soon as the fluid goes blue run in acid from the A burette to maintain a green tint (about pH 7, the optimum reaction for urease). Continue to add the acid as required, warming occasionally, but avoiding heating over 45°C. Generally in about 1 or 2 minutes the reaction appears to be completed. Place the tube in the water bath for another 5 minutes to ensure completion of the hydrolysis of urea to ammonium carbonate. Place the tube in a beaker of cold water whilst the control is being prepared.

To B add 1 ml. of the mercuric-ammonium chloride to inactivate the enzyme. Mix thoroughly and then add 5 ml. of the urease, being careful to prevent any transference of mercury to the bulk of the urease. Add 20 drops of the mixed indicator. Titrate, cautiously, from the B burette through green and steel grey to the first definite mauve tint.

To A add 1 ml. of the mercuric-ammonium chloride and 20 drops of the mixed indicator. Continue the addition of acid to this from the A burette through grey to the first definite mauve tint. This colour fades at first, due to the slow conversion of H_2CO_3 to H_2O and CO_2. When the colour is permanent, add distilled water to B to make the volumes of the fluids the same in the two tubes. This may cause B to go grey. If so add a trace more of acid from the B burette to make the colours match. Should the titrations of either tube be overshot, add the dilute alkali, drop by drop, to the more acid tube until the colour is just mauve. Add exactly the same number of drops of alkali to the other tube. Titrate the tubes, from their appropriate burettes, until the colours match at a mauve tint.

Calculation.—The difference between the amount of acid required for the two tubes is a measure of the urea decomposed to ammonium carbonate in A.

Since 60 g. of urea give 2 mols of $(NH_4)_2CO_3$ and this is neutralized to pH 5 by 2,000 ml. of N.HCl.

Then 1 ml. of N/6 HCl = 5 mg. of urea.

So difference in ml. of acid required × 500
= mg. of urea in 100 ml. urine

and $\frac{\text{Difference in acid}}{2}$ = g. of urea in 100 ml. urine.

NOTES

1. The urease solution can be made by extracting 5 g. of the jack bean meal (about a teaspoonful) with 100 ml. of distilled water and filtering. The filtrate contains more protein than in the preparation described above. The protein is precipitated at the final end-point of the titration, and somewhat obscures the end-point. The cloud in the A tube is always somewhat greater than in B tube, for some reason that I have been unable to determine. With the plain water extract there is always a marked increase in turbidity on allowing it to stand in the refrigerator. A good deal of this clears up on warming to room temperature.

2. The urease prepared by extracting with 0.3 per cent KH_2PO_4 is rather acid, generally about pH 5.8. It is convenient, though not necessary, to treat the filtrate (generally about 80 ml.) with 5 ml. of a 4 per cent solution of Na_2HPO_4, $2H_2O$ (Sörensen's salt). This gives a clear solution and the initial rate of action is much accelerated.

3. The optimum pH for urease is about 7, but it increases slightly as the concentration of urea becomes very low. If desired a fluid of pH 7 can be prepared by mixing 6 ml. of the 4 per cent solution of Na_2HPO_4, $2H_2O$ with 4 ml. of the 3 per cent solution of KH_2PO_4 and adding 20 ml. of distilled water. About 7 ml. of this can be placed in a boiling tube with 3 drops of brom-thymol-blue. The fluid in A should be kept at about the same tint as this, as near as possible. If the mixture is allowed to become a deep blue and is warmed to 45°C., there is a slight loss of volatile ammonia and the enzymatic reaction may not be completed. There is no loss of ammonia at pH 7 and with a normal jack bean meal the hydrolysis of the urea in 1 ml. of a urine that contains 2 g. per 100 ml. is complete in 3 minutes at 40°C.

The apparatus and materials required can be obtained from Messrs. Baird and Tatlock, London.

Reviews

POST-GRADUATE SURGERY.—Edited by R. Maingot, F.R.C.S. (Eng.). Volume III. (Hernia, Eye, Ear, Nose, Pharynx, Larynx, Œsophagus, Diaphragm, Endoscopic Methods, Jaws, Teeth, Tongue, Plastic Surgery, Obstetric Surgery, Cardiovascular and Lymphatic Systems, Venereal Diseases, Deep X-Ray Therapy, Physical Medicine, Orthopædics, etc.). Medical Publications, Limited (37, Bedford Square, W.C.1), London. Pp. xi plus 3573 to 5584 with 1,015 figures in the text. Price, 70s. per volume or £9-9-0 per set of three volumes. [Complete in three volumes. Sold in complete sets only. Price, Rs. 140, Payable Rs. 10 per month: 10 per cent discount for cash. Only available from Messrs. Butterworth and Company (India), Limited, Calcutta]

WITH the publication of the third volume, this monumental work has now been brought to a successful completion. We have no hesitation in declaring that this publication is entitled to be regarded as a standard reference book in surgical literature. The outstanding success of this work is in no small measure due to the harmonious collaboration of the numerous and eminent contributors. Although it is primarily intended for post-graduate students, no practising surgeon could afford to be without it.

The present volume, dealing mainly with special subjects, consists of 23 parts comprising 2000 pages of written matter and 1,015 figures in the text. It opens with an important contribution by Dr. Sleigh Johnson on the medical aspects of surgery. It is in evaluation of the 'surgical risk' and adoption of remedial measures that the physician can most usefully serve his surgical colleague. To the common but important lesion, hernia, Mr. Ogilvie devotes six chapters, admirably covering the subject. Plastic surgery, as a result of war

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experiences, now occupies an important place in surgical practice. There are ten chapters on this subject by Mr. Pomfret Kilner, including mammaplasty and face lifting. The next part, consisting of six chapters, deals with obstetric surgery and is in the capable hands of Dr. Aleck Bourne. The difficult subject of cardio-vascular surgery follows and it is amply covered in five chapters by Mr. Cokkinis. The next part is an exhaustive treatise on the lymphatic system. The first three chapters are by the editor himself, dealing with inflammation and tuberculous cervical lymphadenitis. On the dissemination of malignant disease, Mr. Sampson Handley writes convincingly with the authority of experience. Then follows an instructive article on elephantiasis by Dr. Manson-Bahr. Sir Humphrey Rolleston writes on Hodgkin's lymphogranuloma. The treatment is still very unsatisfactory but a sensitized vaccine of the 'elementary bodies' has given very encouraging results in early cases. There is also an informative chapter on glandular fever by Dr. Box. The remaining three chapters are by Dr. Sleigh Johnson and are devoted to differential diagnosis, thymus and status thymo-lymphaticus.

Considerable space has been allotted in this volume to special subjects. With the incorporation of four chapters on orthopædics by Mr. Buxton the subject has now received sufficient attention. There are two chapters on ophthalmic surgery by Mr. Williamson-Noble, which will be found adequate. The surgery of the ear is in the capable hands of Mr. Watkyn-Thomas and there are eleven chapters on the surgery of the nose by Mr. Jory. In the following pages, endoscopic methods, including bronchoscopy and gastroscopy, have been fully described by Mr. Cann. On the difficult subject of malignant tumours of the pharynx and larynx, there are eight chapters by Mr. Lionel Colledge. On tonsils, adenoids and retropharyngeal abscess Mr. Charles Keogh has some interesting things to say. The surgery of the tongue, mouth and lips by Mr. Stanford Cade is worthy of note. The next part deals with the œsophagus and diaphragm by Mr. O'Shaughnessy. There is an interesting section on the mandible by Mr. Wakeley but there are three additional chapters on dental surgery by Mr. Bowdler Henry. The subject of venereal disease is discussed in two sections of which the first dealing with gonorrhœa is assigned to Dr. Malcolm Simpson. The other section, on syphilis, is contributed by Surgeon-Commander Crawford. Sir Robert Stanton Woods writes an informative chapter on physical medicine, which is assured of ready appreciation. There are three chapters on the difficult subject of deep *x*-ray therapy by Dr. Walter Levitt. The succeeding part by Dr. Harold Dodd deals with some aspects of general surgery. One noteworthy feature of this work, which has already been commended, is the collaboration of eminent physicians. There are seven instructive chapters on 'Some neurological and psychiatric aspects of surgery' by Dr. Rowland Hill.

In conclusion, we would like to offer our hearty congratulations to the editor on the successful completion of an ambitious undertaking. We regret that owing to exigencies of space it has not been possible to do full justice to the merits of this admirable publication. Without any exaggeration we may rightly say that there is no other book like this in the English language. We strongly recommend this book to the notice of the medical profession and the post-graduate student. The printing, get-up and illustrations are excellent and there is an exhaustive index.

P. N. R.

DISEASES OF THE EAR, THROAT AND NOSE.—By J. Douglas McLaggan, M.A., M.B., F.R.C.S. (Eng.), and (Edin.). 1937. H. K. Lewis and Company, Limited, London. Pp. viii plus 338, with 9 plates and 135 illustrations in the text. Price, 15s.

This book is one of Messrs. Lewis's General Practice Series being intended for general practitioners and undergraduates. The author has succeeded in producing a most useful and comprehensive work for although the title is *Disease of the Ear, Throat and Nose* there is also a chapter on diseases of the œsophagus, trachea and bronchi.

The author believes that working knowledge of the anatomy of the parts is more conducive to sound diagnosis and treatment than is a long list of drugs and proprietary preparations. As a result the book is freely illustrated with simple line drawings which emphasize clearly the various anatomical points of importance.

On the subject of tonsillectomy the author condemns entirely the use of the guillotine with a short anæsthetic such as ethyl chloride.

This does not hold in the tropics where chloroform is such a safe anæsthetic that enucleation with the revised guillotine is the method of choice for all children and most adults. It is then a leisurely operation and there is nothing of the 'hit or miss' order about it.

The chapter on laryngeal paralysis is lucid and well illustrated, as also is the chapter on diseases of the œsophagus, trachea and bronchi already referred to. The reproductions of the *x*-ray films are unusually clear.

Altogether an admirable little book which I think will become popular in that section of the profession for which it has been written.

H. S. C.

THE THYROID AND ITS DISEASES.—By J. H. Means, M.D. 1937. J. B. Lippincott Company, Philadelphia and London. Pp. xvi plus 602, Illustrated. Price, 25s. Obtainable from Messrs. Butterworth and Company (India) Limited, Calcutta. Price, Rs. 18-12

This is an excellent monograph which contains an account of the personal experiences of a large number of workers in the thyroid clinic of the Massachusetts General Hospital; their observations extend over a period of over 20 years. It will therefore be of immense value to students and practitioners not only for its wealth of information but also for its usefulness as an aid to the diagnosis and treatment of thyroid diseases. In this book, the author has always sought to gain an insight into the fundamental nature of the morbid processes responsible for the production of the clinical picture and to depend, for diagnosis and treatment, on a scientific understanding of pathogenesis. Nothing could be more commendable than this arrangement, particularly in a book on the thyroid gland.

The author has rightly devoted 3 chapters covering 100 pages to describing the anatomy and physiology of the thyroid gland. The next 3 chapters covering nearly 60 pages embody all the modern ideas about the general pathology and pathological physiology including modern methods of examination of thyroid cases. The remaining 15 chapters deal with the detailed discussion of the pathogenesis, clinical picture, diagnosis and treatment of the various diseases of this organ. There is one feature in this book which is extremely helpful and this is that every chapter ends with an excellent summary of the whole discussion, the perusal of which gives the reader a quick idea of the contents of the chapter. Every chapter closes with a bibliography which may not be considered as exhaustive but nevertheless is very useful. The various conditions under toxic goitre have been discussed so thoroughly that one may consider the description as the last word on the subject up to the present moment. There is a very interesting chapter at the end where the author discusses the use of the gland products in various diseases which are not of thyroid origin, and while appreciating its usefulness in these conditions he rightly sounds a note of warning by saying that the drug should never be considered as a panacea. Similarly, the question of thyroidectomy in non-thyroid diseases has also been discussed with a philosophical discourse on 'facts and fancy in matters thyroid' and this will be found to be very interesting to the reader.

It is indeed difficult to criticize a book of this nature which is an embodiment of prolonged personal experiences. There is one thing however which requires some comment and this is that the book as a whole is too good and elaborate for recommendation as a

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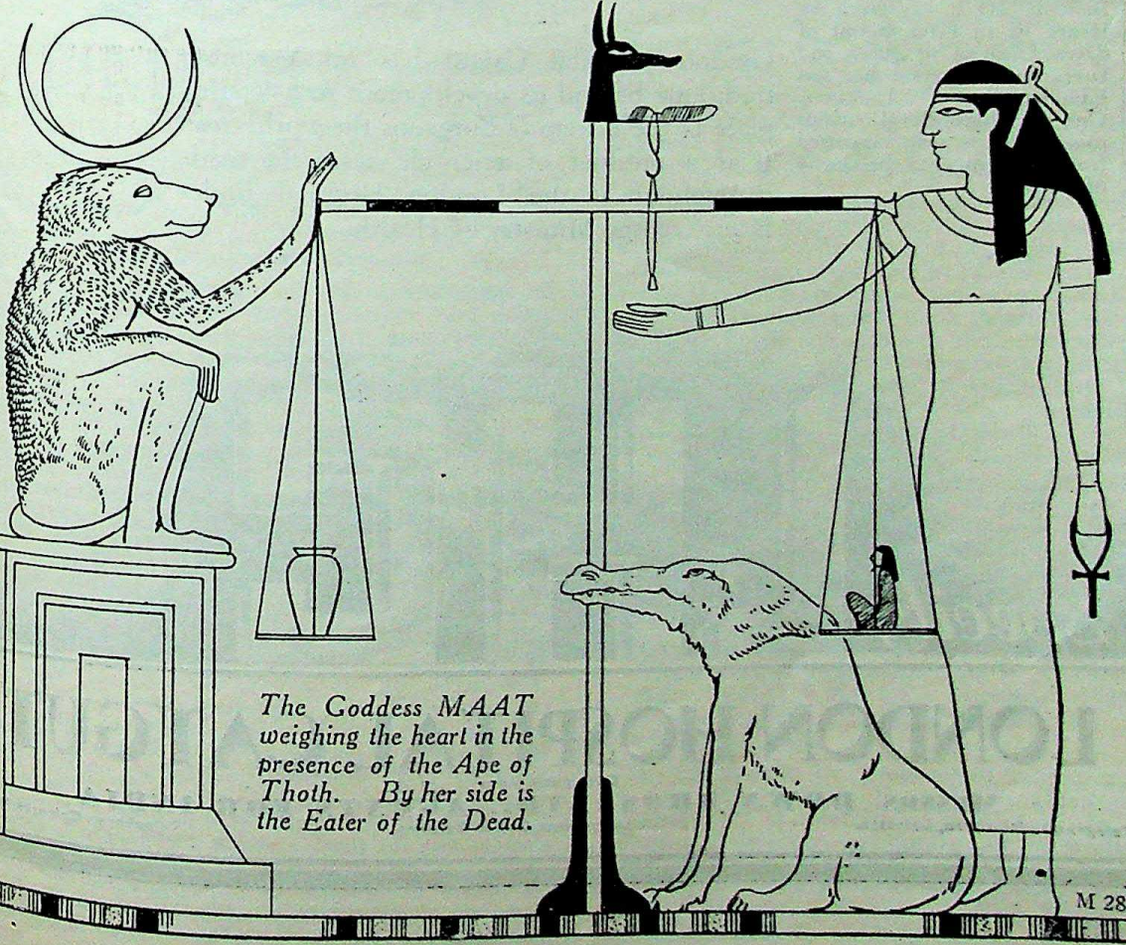

The Goddess MAAT weighing the heart in the presence of the Ape of Thoth. By her side is the Eater of the Dead.

M 289

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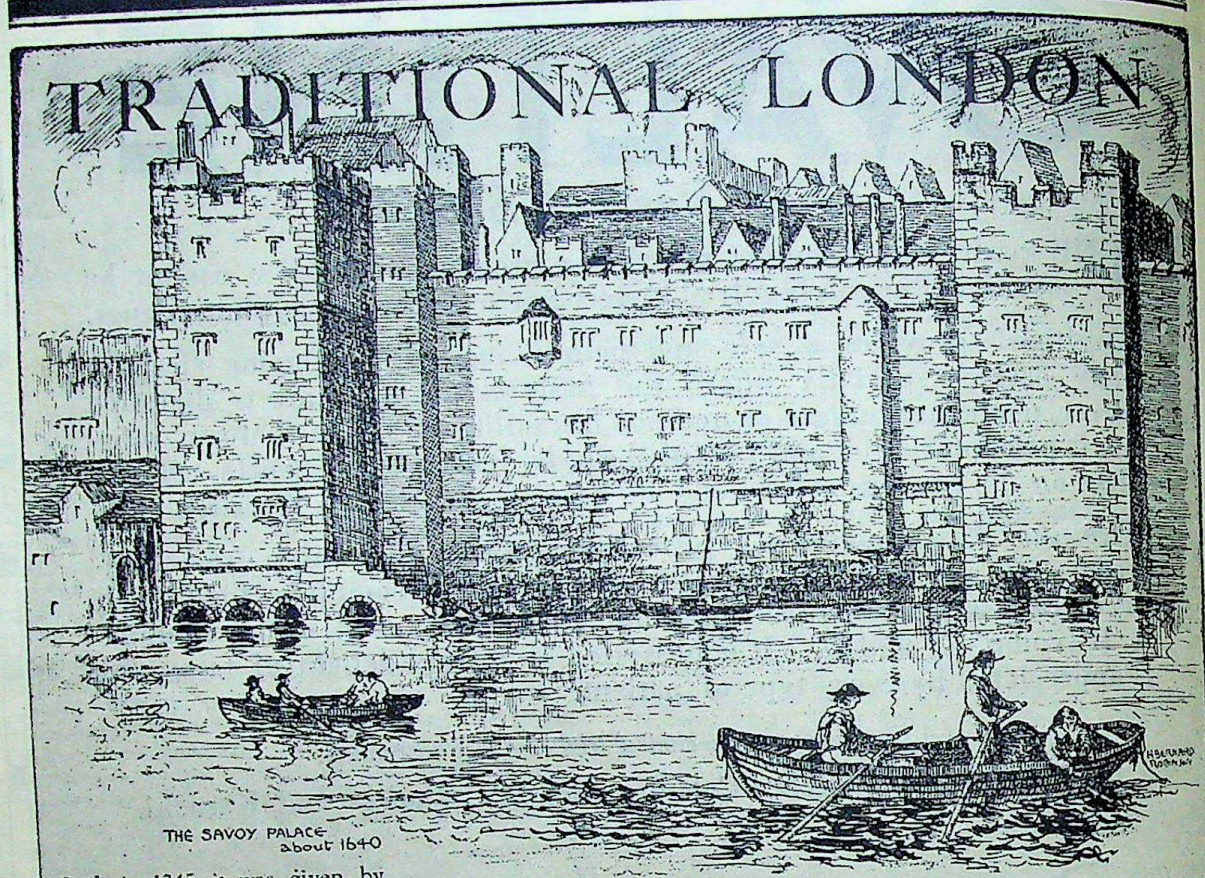

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textbook for students in general. On the contrary it is an admirable handbook for post-graduates and general practitioners in particular.

M. N. D.

MASSAGE AND REMEDIAL EXERCISES IN MEDICAL AND SURGICAL CONDITIONS.—By N. M. Tidy. Third Edition. 1937. John Wright and Sons Limited, Bristol. Pp. xii plus 456. Illustrated. Price, 15s.

This is an excellent textbook for students, and reference book for practitioners. It describes practically every condition treated by massage, the pathology, principles of treatment, results to be expected and complications that may occur. It suggests allied treatments for the conditions described; and also indicates where further information about modern treatments can be obtained. The illustrations are particularly clear and instructive.

The addition of the description of suspension apparatus, and a type of pulley in the treatment of patients, by Mrs. Guthrie-Smith of the Swedish Institute is most welcome.

Every practical masseuse should have easy access to this book.

P. B.

A PRACTICAL GUIDE TO MASSAGE.—By C. I. Carpenter. 1937. Baillière, Tindall and Cox, London. Pp. xiv plus 127, with 20 text-figures. Price, 5s.

This is a useful book to any masseuse in practice. Divided into three parts it describes how the laws of physiology govern the administration of massage, the practical effects of the different movements and the special conditions for which massage and allied treatments are prescribed.

It emphasizes that 'the human organism must be regarded as an integral living entity in which the parts harmonize with the function of the whole, just as, inversely, the function of the smallest part is conditioned by the organism as a whole'.

Carefully studied it will help the practitioner to avoid making his work mechanical.

P. B.

BIOLOGICAL STANDARDIZATION.—By J. H. Burn, M.D. 1937. Oxford University Press, 1937. London. Humphrey Milford. Pp. xviii plus 288. Illustrated. Price, 21s. Obtainable from Oxford University Press, Bombay and Calcutta

Biological standardization, or the measurement of the potency of drugs by the specific reactions they produce upon intact living animals or upon surviving isolated tissues, was first used by Ehrlich to determine the strength of antitoxic sera and soon after Houghton introduced it to regulate the strength of the digitalis group of drugs. Since then, the method has gained steadily in importance and has been extended to a number of substances, *e.g.*, sera, vaccines, antigens, toxins, vitamin and endocrine products, organic arsenic and antimony products, synthetic antimalarial and other remedies, digitalis group of drugs, ergot and its preparations, anthelmintics, aconite, and Indian hemp. In almost all civilized countries, standardization of potent remedies is a legal obligation and workers associated with medico-legal departments, drug-manufacturing houses and drug-control organizations are frequently called upon to give an opinion on such remedies. Prof. Burn's first book *Methods of Biological Assay* was too small and embraced only a limited field of drug-standardization work. A more elaborate treatise from the pen of such an eminent authority was therefore keenly awaited. Such a treatise is now brought out by Prof. Burn and there is little doubt that the book will meet with a tremendous welcome from pharmacologists in all parts of the world.

The book is divided into 19 chapters of which the first two are concerned with the statement of introductory principles and the different methods of calculation of the minimum lethal dose. The third chapter discusses statistical methods of interpreting experimental results and gives formulæ to be used in determining the accuracy and adequacy of experimental findings. Prof. Burn has an enviable way of presenting abstruse scientific data in simple language and in no chapter is this more exemplified than in his mathematical treatment of results. Those who have laboured hopelessly with authoritative books on statistical analysis will have ample reason to be grateful to him for this chapter. In chapters IV to XIX are described the most serviceable methods of standardizing the various therapeutic agents. Pertinent details are given, illustrated whenever necessary with charts, tables, and diagrams, but unnecessary citations about superseded methods and dilatory techniques are judiciously avoided. Several recent methods developed in his own laboratory, *e.g.*, standardization of adrenal cortical hormone on drakes, potency test of organic arsenicals and antimonials by noting the survival time in mice, and the anti-diuretic method of posterior pituitary assay, are described in detail; these are likely to prove very useful and time-saving. In the assay of thyroid extracts and ergot preparations, both chemical and biological assays are given, as the chemical assays with regard to these are gradually being more widely adopted.

The book describes all that is needed for pharmacologists engaged in drug assays in governmental, public health or commercial organizations. It is too technical for students in medical schools and colleges but those who are responsible for teaching would do well to keep themselves abreast of the modern developments in this domain of quantitative pharmacology by reading this excellent book. The reviewer only feels that the utility of the book would have been still further enhanced had the author included an account of the standardization of sera, vaccines, antigens, etc. The author probably had good reasons for not including such a chapter but there is no gainsaying the fact that there is demand for an authoritative publication in this field also. The book is well got up and handy, the binding and format are excellent, and the diagrams are well executed. No modern pharmacological or physiological laboratory should be without a copy.

B. M.

SEX IN RELATION TO SOCIETY.—By Havelock Ellis. 1937. William Heinemann (Medical Books) Limited, London. Pp. xv plus 529. Price, 12s. 6d.

This is an abridged and revised edition of volume VI of the original series 'Studies in the Psychology of Sex' so it is really the first English edition of the book.

When first published this book was almost unique of its kind but in the thirty years since its first appearance there has been a very great change in the attitude of the lay public and of the medical profession so that matters pertaining to sex are now frankly discussed and written about. The consequence is that there has been a glut of books of this nature by qualified and unqualified authors. In spite of this keen competition we consider this book will hold its own for it appeals to us as the best exposition we have read of this subject. This is only to be expected for the author has devoted practically the whole of a long life to the study of the subject of sex problems of which he is such a noted exponent.

It can be recommended to both medical and non-medical readers as a book well worth studying.

TREATMENT OF SOME CHRONIC AND 'INCURABLE' DISEASES.—By A. T. Todd, O.B.E., M.B. (Edin.), M.R.C.P. (Lond.). 1937. John Wright and Sons, Limited, Bristol. Pp. viii plus 203. Price, 10s.

In this volume Dr. Todd deals with a number of diseases the current therapy of which is either unsatisfactory or completely ineffective. In order to influence favourably chronic diseases it is advised that the anatomical diagnosis or outlook be dropped, and the patient be examined for dysfunctions of some part of the body, the correction of which, if possible, may by chance lead to recovery. Many different diseases

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have been ascribed to the same event or cause. For example, chronic nasal sepsis is found to induce asthma, bronchitis, false phthisis, emphysema, rheumatism and nephritis. Duodenal infection is found to produce hepatic dysfunction, chronic rheumatism, false heart disease, cholecystitis, etc. Unfortunately many of these chronic and 'incurable' diseases are very complex processes and are not amenable to simple or rapid therapeusis. The author however has described certain effective procedures which are worth a trial in spite of the fact that some are slow and rather difficult to carry on.

Diabetes mellitus has been considered as a disease in which the liver is chiefly involved, rather than the pancreas, and ordinarily the author has obtained better results with synthalin and bile salts than with insulin. The ketogenic diet is not advised in epilepsy, as it is intolerable to the majority of patients. The use of liquid paraffin in chronic constipation has been deprecated as it is said to depress the hepatic function, increase flatulence and occasionally give rise to giddiness. This appears to be very hypothetical; it would be safer and wiser to encourage its use and stop the abuse of various purgatives.

R. C.

CIVILIZATION AND DISEASE.—By C. P. Donnison, M.D. (Lond.), M.R.C.P. (Lond.). 1937. Baillière, Tindall and Cox, London. Pp. xv plus 222. Price, 10s. 6d.

THIS is a speculative book on the subject of the different distribution of certain diseases among civilized and uncivilized races. The data of practically all the diseases discussed are admittedly inadequate; this is well shown by quoting the summary of chapter two of the book itself.

'A survey of the incidence of diseases in different races with a view to ascertaining the relationship between disease and civilization can be summarized in the following tables:—

I. Diseases that show a close relationship with civilization.

Hyperpiesia.	Diabetes mellitus.
Graves's disease.	Peptic ulcer.
Psychoneurosis.	Rickets.

Obesity.

II. Diseases that appear to show some relationship with civilization but in which the evidence is anomalous or inadequate to justify a definite conclusion.

Cardio-vascular syphilis.	Schizophrenia.
Neuro-syphilis.	Gall stones.
Acute pyelitis and cystitis.	Appendicitis.
Uterine fibro-myomata.	Enlarged prostate.
Pernicious anæmia.	Toxæmias of pregnancy
Angina pectoris.	Renal calculus.
Dental caries.	Coronary thrombosis.
Myxœdema.	Enlarged tonsils and adenoids.

Manic-depressive psychosis.'

In the reviewer's opinion all the diseases might be placed in group II as the evidence produced for all of them is hardly complete enough yet.

As it stands the book is of little practical use but it may serve its purpose in drawing the attention of other workers to the subject and thus it may become the foundation for more exact knowledge.

MEDICAL RESEARCH COUNCIL. SPECIAL REPORT SERIES, NO. 223. SOME QUANTITATIVE ASPECTS OF THE BIOLOGICAL ACTION OF X AND γ RAYS. By C. M. Scott. 1937. Published by His Majesty's Stationery Office, London. Pp. 99. Illustrated. Price, 1s. 6d.

'THE remarkable progress made during the last decade in the treatment of cancer and malignant disease by radium and high voltage x-rays is a matter of general knowledge.

The very rapidity of these advances, however, has caused the practical application to outstrip scientific knowledge: in consequence the therapeutic use of radiations is to a large extent empirical, since there is no basis of agreed fact regarding the essential mode of action of radiations on cells.

One of the chief points brought out by this report is the extraordinary variation which living cells display as regards susceptibility to radiation. It is shown, for example, that the irradiation needed to kill the adult fruit-fly (*Drosophila*) is several thousands of times that needed to kill the eggs of the fly. Translated into terms of drug dosage this would mean that an animal at one stage of its existence was killed by a milligramme of some drug and at a later stage was killed only when the dose amounted to several grammes. The general argument running through the report is that any explanation of the mode of action of radiations on cells must take into account this extraordinary variation in sensitivity, and many attractive theories regarding the action of radiations break down in face of this difficulty. For example, radiations have been shown to interfere with various forms of cellular metabolism and this suggests a possible manner in which they might kill radio-sensitive cells. Such an hypothesis, however, is obviously unsatisfactory unless it explains why radiations have little or no action on other cells with a metabolic mechanism similar to that of the sensitive cells.

The evidence marshalled by the author of the report is in favour of the view that the fundamental action of radiations is on the nucleus of the cell, and thereby on the cell processes that control growth. Hence, the susceptibility of cells to radiation depends very largely upon whether their survival is dependent on the power to carry out cell division.'

CORRIGENDUM

ON p. 55 of our January 1938 issue in the review on 'Wheeler and Jack's Handbook of Medicine' the name of the reviser is John Henderson, not John Anderson as stated in this review.

Abstracts from Reports

ANNUAL REPORT OF THE ALL-INDIA INSTITUTE OF HYGIENE AND PUBLIC HEALTH, 1936

PUBLIC HEALTH RESEARCH

DETAILS of research and investigations bearing on public health problems were given in the annual report of the All-India Institute of Hygiene and Public Health.

Intensive statistical analysis of recorded cholera mortality in different parts of Bengal, the home of cholera, has shown that the incidence of the disease is not uniform throughout the province. It has, however, been possible to define certain areas which are highly endemic. In one of these areas continuous field observations were carried out and a large amount of information collected, the analysis of which, it is hoped, will clear up certain important points in regard to the cholera problem.

Statistical studies were also carried out with a view to developing a method of forecasting cholera epidemics in order to forewarn public health authorities. In addition, there were basic researches into the chemical constitution of cholera germs in relation to the virulence of the organism, and important results have been obtained.

Epidemic dropsy is another disease which received special attention. Field investigations carried out in

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ssam, Bengal and Bihar indicated that certain samples f mustard oil may be to blame. As a result of a series ntrol experiments, including experiments on human nteers, it is emphasized that certain supplies of mustard oil contain a substance which may be responsible for the production of symptoms of epidemic dropsy. The problem is as yet by no means solved.

Problems of nutrition, which are attracting more and more general attention, were also investigated. A large number of common Indian foodstuffs were examined for their salt and vitamin contents, particular attention being given to vitamin B. Nutrition surveys for the determination of the quantity and quality of food and nutritional status of children were carried out in certain institutions at Calcutta and at Ferozepore in the Punjab.

It was found that the main deficiency in diet was the lack of good types of protein and of certain salts, and that this defect in the dietary, which could be corrected by milk, had much to do with the poor physique of children. The caloric value of food required by Indian children was found to be the same as that required by English children.

A fact of great importance which emerged was the desirability of combining fat and, if possible, meat with food containing green vegetables and carrots. These foodstuffs are rich in the substance carotene, which is the main source of vitamin A in India, while fat helps in the absorption of carotene and meat in its conversion into vitamin A.

In the malaria section attention was chiefly devoted to investigations into blackwater fever, which occurs in certain highly malarious localities. Blackwater fever is a highly fatal affliction, but unfortunately scientists are still uncertain as to the exact cause and there is considerable room for improvement in the treatment. Studies of similar conditions in monkeys show that it was caused by paucity of the balance of certain chemical constituents of blood due to lesions in the liver and the adrenal glands. A partial success in the treatment of the disease in many cases was obtained by basing treatment on these findings. Investigation of the disease was extended to human cases and promising results were obtained.

Other malaria problems studied included investigations into the part played by certain important malaria-carrying species of mosquitoes and the spread of malaria in Bengal and certain basic studies on malaria parasites.

Among the points brought out in the study during the year of tuberculosis was the danger from exposure of contacts, especially of children, to open cases in the family.

It was found that in 94 per cent of deaths due directly to childbearing, a primary avoidable factor was present, the main causes of maternal deaths being due to infection arising out of uncleanliness during childbirth, poison in the system and accidents of labour.

The institute among other activities provides advanced training for public health workers on an all-India basis. Admission has to be restricted to 30 students on account of limited laboratory accommodation. In previous years some of the seats remained vacant, but a noticeable feature of the year under report was that there were 74 applicants.

The institute was established with funds provided by a donation of Rs. 17.87 lakhs from the Rockefeller Foundation of the United States of America. The responsibility for its maintenance has been undertaken by the Government of India. Unfortunately the opening of the institute coincided with a period of acute financial stringency, and thus the full development originally contemplated has had to be deferred. As a result, while four sections dealing with Public Health Administration, Malariology, Biochemistry, Nutrition and Epidemiology and Vital Statistics have been functioning, two sections on Sanitary Engineering and Maternity and Child Welfare have had to be kept in abeyance. With a return to improved financial conditions the Government of India have, as from April 1937, sanctioned the opening of these two new sections.

THE ANNUAL REPORT OF THE PUBLIC HEALTH CIRCLE OF THE PUBLIC WORKS DEPARTMENT, BIHAR, FOR THE YEAR 1935-36

Of the more important works taken up by the superintending engineer at Government expense mention may be made of water-supply to the new district headquarters at Luathaha. Besides this, another project of no less importance was in contemplation, *viz*, to provide internal water-supply and sanitary installation in the proposed blocks consisting of an additional paying patients' ward at Itki Sanatorium, for 31 patients.

Of the various other works undertaken on behalf of the various local bodies the Bhagalpur water-supply reorganization scheme amounting to Rs. 5,10,974 still continued to occupy the most important place. Work on the distribution system was completed and satisfactory progress was made with the new intake well at Barari.

Among other works in the hands of the department mention may be made of the water-supply reorganization schemes of Muzaffarpur and Monghyr. The remaining work of fixing house service meters in the reorganization scheme of Muzaffarpur supply was completed. The total expenditure and the expenditure during the year were Rs. 1,86,028 and Rs. 5,569 respectively. The execution of the work in the reorganization scheme of Monghyr water-supply amounting to Rs. 82,039 containing provision for new filtered water and unfiltered water pumping plant, etc., was delayed because an agreement between the Municipality and the Electric Supply Company for the supply of electric power to the proposed new pumping plant had not been executed.

The superintending engineer continued to take the same care and attention as in previous years to the inspection and supervision of all the existing municipal waterworks in the province which were maintained at a total cost of Rs. 3.74 lakhs compared with Rs. 5.59 lakhs in the preceding year. It is satisfactory to note that a fair standard of efficiency was attained. Twenty-one Government pumping plants and sanitary installations were maintained by the circle during the year.

Correspondence

A CRYING NEED FOR A PHARMACY ACT IN INDIA

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—The Drugs Enquiry Committee was appointed by the Government of India in the year 1930; among others, eminent pharmacologists like Col. R. N. Chopra, I.M.S., and Rev. Father Caius served on the committee. The report was submitted to the Government of India in the year 1931. There can be absolutely no doubt that the opinion on drugs and pharmacy given by such persons is authoritative and it is no wonder that the recommendations of the said committee were recognized by one and all to be very valuable. Now it strikes one why the Government of India is sleeping over the report for the last seven years, specially on the question of education and control of pharmacists, while the committee was appointed by the Government of India at their own initiative and the recommendations are so valuable and heavy amount of public money was spent for the report.

There are indications that sporadic attempts are being made to implement some of the recommendations, but the fundamental thing is that no serious attempt is being made to put the recommendations of the committee into effect.

Although the provincial autonomy under the Government of India Act, 1935, was not introduced until six years after the publication of the report, the Central

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Government all along tried to avoid the responsibility of implementing the recommendations on the plea that they are mainly provincial matters and as such any interference by the Central Government will be undesirable. They, therefore, shelved the matter all these years giving laconical replies to insistent public demands. Tone of the Government reply was practically always the same, 'The matter is under examination, but the recommendations are mainly provincial subjects', etc.

In the meantime commercial bodies and the public press of India without any distinction of party did not relax their pressure on the Government to give effect to the recommendations of the committee. The Unemployment Committee appointed by the U. P. Government with the Rt. Hon'ble Sir Tej Bahadur Sapru as president for a solution of the unemployment problem recommended among others to organize the profession of Pharmacy as suggested by Col. R. N. Chopra Committee which will throw new avenues to unemployed youths in the country. One cannot think what is still left for the Government of India to examine for all these years when the soundness of the recommendations has been acknowledged by such eminent authorities like Rt. Hon'ble Sir Tej Bahadur Sapru, Col. Chopra, Col. Gidney and other eminent persons.

We might have difference of opinion with regard to communal representation in the legislatures and other public matters, but in the matter of implementing the recommendations of the Drugs Enquiry Committee, the commercial bodies, the Hindus and the Moslems, majorities and minorities, congress and non-congress and the public press are unanimous without any distinction of caste, creed or party. The Government, therefore, cannot say by any stretch of imagination that if a particular recommendation of the committee be given effect to that would wound the religious feeling of any particular community or party.

The recommendations, if duly implemented will raise the economic status of the people and will bring well-being of the people in general without any caste, creed or party. If anybody is to suffer as a result of giving effect to the same there will be a very small group of people who indulge in nefarious practice of playing on human life with disastrous results, the only aim of the group of these people is to fill up their pockets without any regard to morality. Surely the Government will not hold brief for this class of people. Nothing can therefore stand in the way of the Government in implementing the recommendations particularly as regards the organization of the profession of pharmacy, the crying need of which is now felt more than ever.

Now from the statement of the objects and reasons published with the Import of Drugs Bill recently introduced in the Indian Legislative Assembly we find that the Government of India has taken another dilatory tactic for shelving the matter further. The control of import of drugs is one of many recommendations of the Drugs Enquiry Committee. The Government of India has said that other recommendations such as manufacture, storage and sale of drugs, education and control of pharmacists have been left for the provincial Governments to deal with. It is further understood that the Director-General, Indian Medical Service, has drafted a bill which is under examination of the Government of India dealing with above-mentioned matters now left by the Central Government for the provincial Governments to deal with. This is a clever way of shelving the matter. Now the provincial Governments will have their turn to say from time to time for another decade in reply to the public demands that 'they are examining the bill', they are consulting public bodies', etc. To show how much cold are the provincial Governments in the matter of pharmacy, I shall cite only one instance. The State Medical Faculty of Bengal, the president of which body is the surgeon-general himself and which body at present controls the professions of medicine and pharmacy, approved in February 1934 on the recommendation of the sub-committee appointed by itself, the syllabus for the training of the compounders, as suggested in the Drugs Enquiry Committee's report, forwarded the same to the Government of Bengal for final approval, but in course of these four years no any reply could be obtained from the Governme any communique has been issued by the Gover and the public are still in the dark about the proposal of the Faculty.

This matter has been examined enough and e consultation has been made and there is no reas the earth if the Government intention be frank to steps for implementing one recommendation by Central Government and leave the others for prov Governments. If all the recommendations are effect to by the same enactment by the Central Go ment the obvious advantage will be that unifor will be observed in all provinces and the matter wil expedited.

The Drugs Enquiry Committee has also exam the question very carefully and thoroughly as whether its recommendation should be implemented single enactment or by piece-meal legislation, whe some of the recommendations should be dealt with the Central Government and others by the provin Governments and their unanimous opinion was that recommendations should be implemented by sin enactment and that too by the Central Governm alone.

Considering all these it is fair and reasonable th the Government of India should immediately undertak the legislation in the matter in full, instead of leavin a part for the provincial Governments. Moreover when the bill as drafted by the Director-General, India Medical Service, relating to pharmacy and the bill fo the control of import of drugs are now at the dispos of the Government of India, with a little additiona labour a comprehensive bill comprising all the recom mendations of the committee can be placed before th Indian Legislative Assembly.

Yours, etc.,
KARUNA KUMAR ACHARJEE,
Vice-President,
Bengal Pharmaceutical Association.

MAKARDAH CHARITABLE
DISPENSARY,
P. O. MAKARDAH.
HOWRAH,
8th December, 1937.

[*Note.*—This letter is a little difficult to follow in places, and we do not feel able to 'edit' it. We are, however, in sympathy with the writer's main argument.—EDITOR, *I. M. G.*]

QUININE TOLERANCE IN PREGNANCY

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—The above article in the December 1937 issue interested me very much because it raises some other points. The patient was given nine 10-grain quinine injections intramuscularly, thrice daily and on consecutive days. In the London School of Tropical Medicine and Hygiene they condemn most emphatically intramuscular injections of quinine. They say quinine causes tissue necrosis, much of the quinine remains unabsorbed, at least for a very long time, because of the necrosis the site remains painful, occasionally tetanus develops and abscess formation is fairly frequent. They teach that if quinine is to be given parenterally, it must be given intravenously.

I presume, all the injections were given intragluteally. It would be interesting to know what was the attitude of the patient towards the injections. I have no experience in this method, because, knowing that it is painful, I always use intravenous method whenever quinine by injections is indicated; I guess, however, that it would be difficult to find ten painless sites in such a short period.

In the particular case, when it was decided to give quinine parenterally and when evidently quick result rather than a slow and prolonged effect was required,

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I wonder why intramuscular instead of intravenous route was chosen and that too all through.

Yours, etc.,

RAJANINATH R. GHAREKHAN,
M.B., B.S., L.M., D.T.M. & H.,
Medical Officer.

BARODA STATE,
DABHOI,
30th December, 1937.

[*Note.*—We are in almost complete agreement with our correspondent.

Ninety-nine times out of a hundred administration of quinine by the oral route is adequate, and in the hundredth case the intravenous route is, in our opinion, preferable to the intramuscular. Circumstance may demand one and possibly a second dose of parenteral quinine, but any circumstances that demand an extended course of intramuscular quinine are unconnected with the treatment of malaria.

On the other hand, many conscientious and intelligent practitioners give quinine by the intramuscular route frequently, and do not get bad results. Injections of quinine undoubtedly cause necrosis of the tissues, but such a condition is not necessarily dangerous and may even be advantageous. The statement that quinine given intramuscularly in ordinary clinical doses may not be absorbed requires to be proved; certain experiments on which this claim is based did not, in our opinion, supply this proof.—EDITOR, *I. M. G.*]

Service Notes

APPOINTMENTS AND TRANSFERS

BREVET-COLONEL R. N. CHOPRA, C.I.E., Professor of Pharmacology, School of Tropical Medicine, Calcutta, is confirmed as Director of the same institution, with effect from 8th August, 1935.

Lieutenant-Colonel Amir Chand, Officiating Professor of Medicine, King Edward Medical College, Lahore, has been confirmed in his appointment, with effect from 1st March, 1937.

Lieutenant-Colonel J. C. Pyper has been posted as Civil Surgeon, Quetta. Dated 1st November, 1937.

Lieutenant-Colonel R. H. Candy, C.I.E., on return from leave, has been appointed as Civil Surgeon, Poona, with attached duties, with effect from 10th November, 1937, afternoon.

Lieutenant-Colonel F. R. Thornton, Civil Surgeon, Poona, on relief by Lieutenant-Colonel R. H. Candy, has been appointed as Civil Surgeon, Dharwar, with attached duties, with effect from 19th November, 1937.

On return from leave Lieutenant-Colonel M. Das, M.C., is appointed to be Superintendent of the Alipore Central Jail, with effect from the forenoon of the 19th November, 1937, *vice* Major S. Annaswami transferred.

Lieutenant-Colonel J. P. Canteenwalla took over charge of the Medical Store Depôt, Calcutta, on 22nd November, 1937.

Lieutenant-Colonel R. Sweet, D.S.O., took over charge of the Medical Store Depôt, Bombay, on 24th November, 1937.

Lieutenant-Colonel S. Nag made over charge of the Mymensingh Jail to Lieutenant-Colonel B. H. Singh, on the forenoon of 24th November, 1937.

Lieutenant-Colonel A. Ba Thaw appointed as Assistant Inspector-General of Civil Hospitals, Burma. Dated 11th December, 1937.

Lieutenant-Colonel R. H. Malone, Pathologist, Rangoon General Hospital, appointed to hold full charge of the duties of the Director, Pasteur Institute of Burma, Rangoon, in addition to his own. Dated 14th December, 1937.

Major G. F. Taylor, Officiating Professor of Clinical Medicine King Edward Medical College, Lahore, has been confirmed in his appointment, with effect from 1st March, 1937.

Major T. Doran, on return from leave, has been posted as Civil Surgeon, Belgaum, with effect from 15th October, 1937.

Major C. K. Lakshmanan appointed as Port Health Officer, Calcutta, with effect from the afternoon of 16th October, 1937.

Major E. M. Sewell, transferred from the Military Department to Madras Civil, will be deemed to have been on reserve duty in the Government General Hospital, Madras, from 15th November, 1937, to 17th November, 1937 (afternoon), and then posted to act as District Medical Officer, Bellary, with effect from the date of taking charge.

Major P. A. C. Davenport appointed as Civil Surgeon, Toungoo. Dated 4th December, 1937.

Major S. Annaswami, Officiating Superintendent, Alipore Central Jail, on being relieved of his charge by Lieutenant-Colonel M. Das, M.C., in the forenoon of 19th November, 1937, is appointed to act as Superintendent of the Midnapore Central Jail.

Major Gerard Kelly, on the expiry of his leave, is appointed as First Resident Medical Officer, Presidency General Hospital, Calcutta, *vice* Captain E. H. Lossing.

Captain W. W. Laughland has been appointed to officiate as Superintendent, Central Mental Hospital, Yeravda, with effect from 1st October, 1937, *vice* Lieutenant-Colonel E. C. A. Smith, granted leave.

Captain M. H. Shah is appointed as a leave reserve officer to the Irwin Hospital, Delhi. Dated 16th October, 1937.

Captain J. D. Grant has been posted as Civil Surgeon, Sibi and Loralai. Dated 15th November, 1937.

Captain M. Jaffar is appointed to officiate as Health Officer, Karachi Air Port. Dated 16th November, 1937.

Captain A. A. Pullar, Assistant to the Civil Surgeon, Poona, has been appointed to officiate as Presidency Surgeon, Bombay, with effect from 6th December, 1937, *vice* Captain H. S. Waters, granted leave.

Captain H. Min Sein is appointed as Civil Surgeon, Bassein. Dated 8th December, 1937.

Captain A. K. Gupta made over charge of the Berhampore Jail to Dr. B. N. Chakravarti in the afternoon of 6th December, 1937.

Captain E. H. Lossing, First Resident Medical Officer, Presidency General Hospital, Calcutta, on relief, is posted to Hooghly as Civil Surgeon, *vice* Dr. Jatindra Mohan Mukharji.

To be Lieutenants (on probation)

1st November, 1937

Thomas Meurig Williams, with seniority from 1st May, 1936.

Robert Dennis Ewing, with seniority from 1st November, 1936.

Patrick Bernard Cusack, with seniority from 1st November, 1936.

Thomas Patrick Binns, with seniority from 26th March, 1937.

William Walter Coppinger, with seniority from 1st May, 1937.

Richard Douglas Davis Birdwood.

John Murray Drew.

The undermentioned officers are restored to the establishment

1st November, 1937

Lieutenant N. P. Woodgate-Jones.

Lieutenant W. H. A. Thorne.

LEAVE

The portion of leave from the 19th November, 1937, to 9th January, 1928, out of the 7 months' leave granted to Lieutenant-Colonel M. Das in previous notification, is hereby cancelled.

Lieutenant-Colonel G. C. Maitra is granted leave for 3 months from 14th December, 1937.

Major W. Aitchison, M.C., Civil Surgeon, Cawnpore, is granted leave for 4 months from 4th December, 1937.

Major D. MacD. Fraser, Civil Surgeon, Dehra Dun, is granted leave for 4 months from 1st December, 1937.

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Major R. A. Wesson, Civil Surgeon, Moradabad, is granted 8 months' leave from 3rd January, 1938, with permission to prefix the Christmas holidays.

Major K. S. Fitch, Civil Surgeon, is granted leave for 10 months, with effect from 10th November, 1937.

Captain D. K. L. Lindsay is granted leave on average pay for 4 months, study leave for 5 months and furlough for 1 month from 27th November, 1937.

Captain H. S. Waters, Presidency Surgeon, Bombay, is granted leave ex-India on average pay for 8 months combined with leave on half average pay for 3 months, with effect from 4th December, 1937.

PROMOTIONS

Major to be Lieutenant-Colonel

J. H. Barrett. Dated 2nd November, 1937.

Captains to be Majors

R. M. Lloyd Still. Dated 1st April, 1937.
L. G. Buckhurst. Dated 10th November, 1937.
D. C. Chopra. Dated 19th November, 1937.
Jaswant Singh. Dated 19th November, 1937.
P. P. Chowdry. Dated 22nd November, 1937.
P. C. Dutta. Dated 25th November, 1937.

Lieutenants to be Captains

J. R. Kerr. Dated 8th October, 1937, with seniority from 1st May, 1937.

K. I. E. Macleod. Dated 8th October, 1937, with seniority from 1st May, 1937.

J. D. Munroe. Dated 8th October, 1937, with seniority from 1st May, 1937.

J. H. Walters. Dated 7th October, 1937, with seniority from 1st November, 1936.

C. F. Mayo-Smith. Dated 9th October, 1937, with seniority from 1st May, 1937.

W. C. Templeton. Dated 8th October, 1937, with seniority from 1st May, 1937.

Notes

ANNOUNCEMENT

A NEW lecture room has been opened in the office premises of the Havero Trading Company at Bombay. The opening ceremony was performed by Lieut.-Colonel S. S. Vazifdar on 19th December, 1937, before a distinguished gathering of the medical profession of Bombay.

In welcoming the guests, Dr. K. Soltner, PH.D. (Berlin), emphasized the long-felt demand for such a lecture room in our establishment at Bombay. Now that the long-cherished wish has been consummated, he hoped that this room would henceforward serve as a common platform for more effective interchange of opinions and scientific findings between the clinicians of this country and the research workers of the 'Bayer' laboratories in Germany.

Lieut.-Colonel Vazifdar in his presidential address gave a short but impressive outline of the history of evolution of chemotherapeutic drugs and exhorted the audience to ponder over the real significance to suffering humanity of the discovery of drugs like 'Bayer' 205, salvarsan, atebrin and plasmochin, prontosil, etc. Finally, he emphasized the need of Indian collaboration in the forward march of scientific therapy in the growth of which 'Bayer' laboratories have done so much during its fifty years of existence.

After a light tea, a scientific film on 'Circulation' was screened. The function ended with a vote of thanks to the guests and the president from Dr. Soltner on behalf of Messrs. Havero Trading Company Limited, as well as the research workers in 'Bayer' laboratories.

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O-R-95 is unusually effective in controlling bacterial infections, inflammation and painful conditions of the mouth, tongue, gums, soft palate, tonsils, nasopharynx and hypopharynx, introitus of the larynx and œsophagus. Quinsy, laryngitis and pharyngitis respond promptly to the action of O-R-95. Sore throat and tonsillitis may be checked at the onset by its use.

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Original Articles

ON THE ILLUSTRATION OF THE RHEUMATIC PROCESSES IN A MODERN MUSEUM OF PATHOLOGY

(A PAPER TO ILLUSTRATE HOW PATHOLOGICAL PROCESSES CAN BE CORRELATED WITH THE CLINICAL STAGES THROUGH WHICH DISEASES OFTEN PASS AND AS MAY BE EXEMPLIFIED BY THE EIGHT CLINICAL STAGES THROUGH WHICH RHEUMATIC INFECTION OFTEN PROGRESSES IN YOUNG INDIANS)

By H. STOTT, M.D., F.R.C.P., D.P.H.
LIEUTENANT-COLONEL, I.M.S.
Professor of Pathology and Physician, King George's Hospital, and Dean of the Medical Faculty, Lucknow

Introduction : The stages of progressive disease

A DEFINITE advance in the teaching of 'disease' to medical students during the past two or three decades has been an emphasis on the fact that disease is not an isolated static condition—as so often suggested by a 'meat' specimen mounted in a pathology museum—but that it is a *progressive* pathological process. A disease process should be visualized as arising under a variety of predisposing and causative conditions often terminating in resolution and recovery. But not infrequently the process progresses through a series of stages extending perhaps over several years to a permanent healed scar which may subsequently cause mechanical failure in the structure concerned.

It is stimulating to the student, and to the teacher, to form a clear mental picture of each of these various clinical stages. And, further, to determine in which stage any given clinical case that is before them may be classed. In such a case, evidence may be found in the patient's history of the previous stages through which his disease has already developed, and the possible or probable further stages through which the process may be expected to travel can be forecast. Finally, with each clinical stage the laboratory and post-mortem findings can be correlated. Every case of a given disease does not of course invariably progress through the complete series of stages into which that disease may be in general divided; such divisions are artificial. Any given case may exhibit a fulminating, acute, subacute or more chronic development. Any one stage or stages may not be apparent—and may progress insidiously entirely unobserved by the patient. The disease may thus appear to arise in its third, fourth or fifth stage. Or one or two or even more stages may be combined and obvious at the same time. Nevertheless, the general rule holds true that most diseases do progress through fairly well-defined stages, which can be recognized and separated from each other by clinical symptoms, signs, instrumental investigations, laboratory and radiological tests and by post-mortem examination. As has been already remarked the recognition of such stages is stimulating; it carries the teacher and the taught back to predisposing and exciting causes, and thus to a consideration of the important aspect of prevention. It renders the diagnosis more accurate, the treatment applied more appropriate, the prognosis truer, the prevention of relapse or of sequelæ more intelligible, and the general advice offered as to the patient's conduct of life sounder.

It has been my endeavour, at the bedside, in the lecture room, in the laboratory, in the dead house and also by the construction of a special division of the King George's Medical College Museum of Pathology (division V: 'Disease processes in separate diseases') to emphasize such a system of teaching to the students entrusted to my care.

The scope of this paper

The present paper illustrates this general proposition concerning the progressive stages of disease by describing those particular clinical stages through which one disease, rheumatic infection, is apt to progress. In the paper's subtitle the words 'in young Indians' might be taken to indicate that stages in them differ from those 'in young Europeans'. But this is not the case. These words have been added to emphasize that rheumatic infection does occur and indeed is by no means uncommon 'in Indians'—and further that such infection commonly occurs in Indian juveniles and the sequelæ in young Indian adults. Thus, an emphasis lies on the well-recognized fact that rheumatic infection is mainly a condition of childhood, of youth and of young adults. To those who are aware of the fallacious way in which the civil hospital statistics of India often show acute muscle and joint pains with or without fever, in persons of 40 or 50 years of age as acute rheumatic infection, such emphasis will not be regarded as redundant.

This paper further deals briefly with the illustration of the clinical stages as of one disease (rheumatic infection) correlated with the pathological processes of one given disease (acute rheumatic infection) in a modern museum of pathology. Such illustration will be made clearer by photographs of the exhibits of this disease process in the King George's Medical College Museum of Pathology. The exhibit is not meant to be complete in every detail but illustrates the manner in which the stages of disease processes may be taught in the wards, and may be visually demonstrated by specimens in a 'living' museum of pathology.

The illustration in King George's Medical College Museum of Pathology of the pathological and clinical process of separate diseases

One division (V) of our pathological museum is entirely concerned with the correlation of

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pathological processes with clinical signs in the several stages of individual diseases. So far some 16 diseases have been thus illustrated grouped in the following manner :—

Division V : Pathological processes in separate diseases, correlated with their clinical signs

V¹. *Of the inflammatory group.*
- A. Rheumatic carditis.
- B. Acquired syphilis (arteriolitis).
- C. Glomerulo-tubular nephritis.

V². *Of the degenerative group.*
- D. Hepatic cirrhosis.
- E. Arteriosclerosis.
- F. Atheroma.
- G. Ankylostomiasis.

V³. *Of the metabolic group.*
- H. The acute diabetes of the young.
- I. The chronic diabetes of older persons.
- J. Gastro-duodenal ulcer.

V⁴. *Of the psychological group.*
- K. Manic depressive insanity.

V⁵. *Of tumour growth.*
- L. Gastric adeno-carcinoma.

V⁶. *Of immunological reactions to infection.*
- M. Typhoid fever.
- N. Relapsing fever.
- O. Typhus fever.
- P. Pneumonia.

It would render all museums of pathology of far greater 'living' value and of far greater practical utility if a division showing such pathological processes in individual diseases were introduced, and further if as large a number as possible of diseases were illustrated in this manner.

The eight clinical stages through which rheumatic infection often progresses

It is my custom to describe and teach the following clinical stages of this infection :—

Clinical stages.		*Approximate duration*
Stage I.	Tonsillitis. Damp chills	Few days.
Stage II.	Quiescent ..	Few weeks.
Stage III.	Acute rheumatic endocarditis.	1 to 2 months.
Stage IV.	Symptomless ..	Few years.
Stage V.	Effort syndrome ..	Few years.
Stage VI.	Auricular fibrillation ..	Months or years.
Stage VII.	Tricuspid regurgitation and cardiac œdema.	
Stage VIII.	Slow death and post-mortem.	—

These stages might be summarized in the following progressive clinical history : a young child, debilitated perhaps from ill-nourishment or from severe ankylostomiasis or malarial anæmia, living perhaps in damp surroundings round a damp dwelling exposed to monsoon rains or to wetting from water during his work (*e.g.*, *dhobies*), subject to chills from monsoon or cold night winds or even from the draughts of bad ventilation or even from punkas, contracts recurrent sore throat and subacute tonsillitis. After several relapses of this condition the tonsillitis becomes quiescent but flares up, possibly after exposure to a damp chill, into fever and acute or subacute rheumatic endocarditis—possibly with exquisitely tender and painful joints —from which the pains and swelling rapidly pass to other joints. After a few months' convalescence the child passes into a symptomless stage when it has apparently completely recovered. During this time, however, the inflamed fibrous tissue around the ring of the mitral valve gradually contracts down to a firm organized scar tissue producing obvious signs of mitral stenosis. A more acute, more intense inflammation of the mitral valve will result in its acute destruction with the production of mitral regurgitation rather than of mitral stenosis. During this period the preceding tonsillitis, febrile carditis, and joint pains and swellings are forgotten. Dyspnœa on exertion gradually develops—at first hardly noticed but later becoming more and more incapacitating—until the patient becomes completely bedridden with auricular fibrillation or congestive heart failure. The admission is now made for heart failure from mitral valve disease. After relief by rest and digitalis and after subséquent relapse, the patient dies with a clinical or post-mortem diagnosis of heart failure. The original rheumatic causative factor, the dampness responsible at the onset, the subsequent acute 'growing' limb pains and joint trouble and the carditis have too often been completely overlooked or forgotten, alike by patient and doctor, or, if recalled at all, they are probably entirely unconnected with the subsequent heart failure. Frequently perhaps the early rheumatic symptoms have been so slight as to have entirely escaped notice, *i.e.*, they have been subacute in nature, or rheumatic symptoms may have been entirely absent, as is indeed by no means unusual. Small wonder then that rheumatic infection in India has so often been considered 'non-existent' or 'very rare'.

The illustration of the clinical stages and of the correlated pathological processes of rheumatic infection in the King George's Medical College Museum of Pathology

Pathology

In the King George's Medical College Museum of Pathology each of the above-named stages is illustrated by exhibits which display the pathological processes, correlated with the clinical symptoms and signs on typed charts, by framed photographs or by clay models, made in the department, or by actual meat specimens. The arrangement is set out below and is further

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PLATE V

The stages of rheumatic infection—as illustrated in King George's Medical College Museum of Pathology.

Stage I. Recurrent tonsillitis. Stage II. Quiescent. Stage III. Acute endocarditis. Stage IV. Symptomless. Stage V. Effort syndrome. Stage VI. Auricular fibrillation. Stage VII. Congestive heart failure. Stage VIII. Post mortem.

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illustrated in the accompanying photographs, from which some exhibits are missing :—

Stage I. Acute or subacute tonsillitis

Exhibits :—

1. *Typed chart*

Pathological process—

Acute hæmolytic streptococcus infection.

Clinical process—

History of repeated exposure to damp, or of chill, or of recurrent tonsillitis.

2. *Model,* showing chronic tonsillitis.
3. *Model,* showing damp environment.
4. *Stained throat smear.*

Long-chained streptococci, with pus cells.

Stage II. Quiescent

Exhibits :—

1. *Typed chart*

No clinical symptoms. Perhaps chronic tonsillitis, and some anæmia.

Stage III. Acute or subacute endocarditis

Exhibits :—

1. *Typed chart*

Pathological process—

Acute or subacute mitral valvulitis. Myocarditis. Pericarditis.

Symptoms—

Fever, dyspnœa, point pains, cardiac pain.

Signs—

Cardiac dilatation. Soft systolic murmur.

2. *Clay model*

Vegetations on mitral valve.

Stage IV. Symptomless

Exhibits :—

1. *Typed chart*

Pathological process—

Contracting mitral fibrosis; Enlarging L. auricle; Smaller L. ventricle.

Signs—

'Slapping' first sound; Presystolic murmur, after exercise.

Stage V. Effort syndrome

Exhibits :—

1. *Typed chart*

Pathological process—

Sclerosis; and atheroma; pulmonary artery; back pressure in lung; congested capillaries, bronchial catarrh, blood oozing infarction, brown induration, hydrothorax.

Symptoms—

Dyspnœa; Cough; Brown sputum; Hæmoptysis; Precordial distension; Pain.

Signs—

Presystolic murmur; Pulmonary first sound increased; 'P' wave +; R. V. preponderance.

2. *Model.*

Pulmonary artery showing sclerosis and atheroma.

3. *Coloured lung section,* showing :—

Chronic passive congestion, with muscle hypertrophy (fibrous), induration and pigmented heart-failure cells in alveoli.

4. *Electrocardiogram,* showing :—

Accentuated 'P' wave, and R. V. preponderance.

5. *Model of European girl's face.*

High coloured cheeks and lips; Often blue eyes, fair hair.

Stage VI. Auricular fibrillation

Exhibits :—

1. *Typed chart*

Pathological process—

Auricular failure.

Symptoms—

Continuous dyspnœa; Orthopnœa; Palpitation.

Signs—

Auricular fibrillation; No presystolic murmur; Mid-diastolic murmur; Rheumatic nodules.

2. *Photo :*—Of orthopnœic ward patient.
3. *Electrocardiogram.*

Typical irregular irregularity.

Stage VII. Tricuspid regurgitation. Cardiac water-logging

Exhibits :—

1. *Typed chart*

Pathological process—

Whole heart dilates; Mitral and tricuspid regurgitation; Venous back pressure.

Symptoms—

Congestive failure; Cardiac œdema.

Signs—

Pulse, rapid and feeble; Apex beat, diffuse and feeble; Systolic murmur.

2. *Model.*

Enlarged square-shaped heart.

Stage VIII. Post-mortem diagnosis

Congestive heart failure; Rheumatic mitral stenosis.

External appearance

A yound adult, often 20 to 25, ascites, general anasarca.

Internal appearance

Cardio-vascular system

Of heart, L. A., R. V., and R. A., only seen, because enlarged.

L. A., especially, hypertrophied and dilated.

Endocardium, opaque.

Anti-mortem appendix-clot.

Mitral valve, cusps thickened, opaque, edges adherent.

Button-hole, diaphragmatic or funnel-shaped.

Chordæ and papillary muscles, shortened.

Pulmonary artery, atheroma.

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Respiratory system

Bronchi, brown-tinged mucus.

Lungs bulky (blood), firm (fibrosis), and dark (hæmoglobin). (Brown induration). Infarcts, triangular, raised, red solid.

Digestive system

Mucous membrane congested. Contents, blood stained.

Liver, congested, enlarged, nutmeg.

Spleen, congested, deep purple, tense, rounded, firm.

Infarcts, white, firm, triangular or rectangular, early hyperæmic outline.

Kidneys, congested. Capsule, tense. Pyramids, dark.

Cortex, red streaks (vessels), red dots (glomeruli) and grey streaks (tubules).

Infarcts, white, triangular.

Brain. Cream cysts from old infarcts.

A typical clinical life history of rheumatic infection as might be read at a post mortem

The child was taken ill with fever and heart pain after being rain-soaked in the monsoon and sleeping through a night on the wet ground. The large joints were then acutely inflamed and exquisitely tender. Gradual recovery. A relapse of joint pains with pericarditis and a pleural rub for three weeks after a severe drenching in storm rain. No further symptoms for five years when dyspnœa and cough with brownish sputum (heart-failure cells) gradually developed. The voice became husky from pressure of the enlarged left auricle on the recurrent laryngeal nerve. One hæmoptysis and persistent precordial discomfort followed. Auricular fibrillation was controlled for some time with digitalis. Towards the end a severe splenic pain for twenty-four hours and transient slight hemiplegia for three days were probably due to embolism. Slow death with increasing water-logging.

Conclusion

If diseases in general were grouped in the museum of pathology in some such manner as this, *viz*, to illustrate the *progressive* stages through which each disease passes and with each such stage the clinical symptoms, signs and findings were briefly described, then each disease process would become far more readily intelligible to the student, and more readily demonstrable by the teacher. And the knowledge of each individual disease would be clarified and enriched. And if the disease selected for the demonstration of this principle were rheumatic fever, then the knowledge of the occurrence, prevalence, cause, early recognition and importance of rheumatic infection in Indian children and young Indian adults, the existence of which in India is still by many definitely doubted or only regarded as being of great 'rarity', would be increasingly recognized.

(*Continued at foot of next column*)

PRESENT POSITION OF THE OPIUM SMOKING HABIT IN INDIA

PART II. PREPARATIONS OF OPIUM USED FOR SMOKING AND MODE OF INDULGENCE

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IN a previous paper we have given an account of the incidence of the opium smoking habit in India. We carried out a general survey of the occurrence of this habit in different provinces and by extensive work in the field collected statistics with regard to the approximate number of addicts in each province. In this paper we propose to deal with the preparations used for smoking, the methods of smoking, the types of persons addicted to this habit, and the control exercised by the state in suppressing this habit.

Preparations used for smoking

The excise opium as it is sold in this country in licensed shops is not suitable for smoking. It is, therefore, necessary to convert it by certain manipulations into a suitable preparation. This process requires certain equipment and takes a good deal of time, and this fact is probably responsible for the existence of opium smoking dens, as it is here that opium for smoking is prepared and sold.

In India two preparations of opium are generally used for smoking. These are *madak* and *chandu*. A third preparation which is rarely used in this country is opium *dross*.

(*Continued from previous column*)

Summary

1. Disease is best regarded as a continuous process usually progressing through well-recognized clinical stages.

2. With each clinical stage, the clinical symptoms, signs, instrumental investigations, laboratory and radiological tests and post-mortem appearance can be correlated.

3. In a 'living' museum of pathology, one division should deal with the pathological processes in individual diseases and illustrating each disease grouped in such stages and correlated with clinical signs and symptoms.

4. An outline of such a division in the King George's Medical College Museum of Pathology is given.

5. The eight clinical stages through which rheumatic infection often progresses are enumerated, and the exhibits illustrating each stage in the museum of pathology are described and photographed.

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Madak.—The use of *madak* in India is much more extensive than of *chandu*, and in most parts of the country this preparation is smoked. The following is, briefly, the method employed for its preparation:—

Raw or excise opium is mixed with water which is then heated to boiling point. The boiling is continued and the impurities which form as a scum on the surface of the boiling fluid are gradually removed. The heating is continued till a thick suspension is formed. This is then strained through a piece of cloth and charred leaves of *Acacia arabica* (*babul*) are gradually mixed with it till it assumes the consistency of a thick stiff paste. This mass is then rolled into small balls called *madak golis* which are available for smoking purposes. As a rule $2\frac{1}{2}$ ounces of *madak* are prepared from one ounce of opium. Sometimes instead of *babul* leaves, leaves of *Phylanthus emblica* (*amla*), *Acacia leucophlœa* Wild (*safed babul*) and *Piper betle* Linn. (*pan*) are used. In former days, burnt gold or silver threads (*kalabatoo*) were sometimes added to the mass as it was supposed that these imparted to the mixture aphrodisiac and tonic properties. We have, however, not been able to trace this practice in India at the present time.

In Assam, a slightly different method of preparation is employed and to this preparation the name *kanipankhawa* is given. The required quantity of opium is put on a ladle or a spoon, called a *heta*, along with some water, and this is heated for twenty to thirty minutes till it becomes thick in consistency. The impurities are removed as heating goes on by means of cotton-wool. After pouring out the decoction from the *heta* into a small pan, it is cleaned and washed and again heated for about half an hour till it is converted into a sticky paste; this is put aside. Betel leaves are cut into fine pieces and fried in an iron pan called *keraki*. The sticky mass of opium and the fried betel leaves are mixed together and heated until the leaves assume a greenish-brown tinge. The mixture is then ready for smoking.

Chandu and chandul *or clarified opium.*—This is a stronger preparation and is only used in India by persons who are heavy smokers, or by the Chinese smokers. *Chandu* is prepared by boiling a strained solution of opium in water in a large copper cauldron till it becomes thick in consistency. As the concentration proceeds crusts form on the surface of the simmering mass. These are removed as they form, until finally a thick mass of the consistency and appearance of coal tar is obtained. This is the 'smokable extract' and is the *chandu* or *chandul* of opium smokers. The *chandu* commonly smoked is often adulterated by addition of *dross* scraped from *chandu* pipes which has a high morphine content.

A perusal of the literature shows that in former days *chandu* was used in certain parts of India though perhaps to a limited extent. This is shown by the fact that the word *chandubaz* or *chandu* smoker frequently occurs in the old records. At the present time, smoking of *chandu* is practically confined to the Chinese population in this country, though the method is not entirely unknown to Indian smokers. In the Far East *chandu* is the chief preparation employed by smokers.

Opium dross.—Opium *dross* is the residue left in the pipe when either *chandu* or *madak* is smoked. The quantity of the *dross* produced depends on the type of the pipe used and the method of smoking employed. Usually the amount of *dross* produced corresponds to a maximum of 60 per cent and a minimum of 40 per cent of the quantity of the prepared opium smoked. The amount of *dross* produced by *madak* smoking is much less in quantity and varies from 20 to 30 per cent of the amount smoked. As *dross* is sometimes used for smoking purposes, the question of its morphine content is important. Very little work, however, is done in this connection, but W. E. Dixon has shown that only a small percentage of the morphine content of prepared opium is absorbed by the smoker when inhaling the smoke. Most of the alkaloid must either be destroyed or left behind in the *dross*. Chemical analysis of *dross* showed that the actual amount of morphine in this substance is not more than the amount contained in the prepared opium from which it is obtained. As the *dross* amounts to only about 50 per cent of the weight of the prepared opium smoked, it would appear that a proportion of morphine is destroyed during the process of combustion of opium.

The question of morphine content of prepared opium and *dross* and the harm resulting from the use of *dross* needs further investigation. So far as India is concerned, however, it is of minor importance. It has been observed that the old and inveterate smoker sometimes mixes *dross* with prepared opium in order to enhance its intoxicating effects. Others and especially those with small means make pills of *dross* and take it by the mouth when they cannot afford to buy prepared opium to indulge in a smoke. They are also known to put *dross* into tea, coffee or other beverages.

The *dross* is usually prepared for smoking by mixing it with water and subjecting it to heat till it assumes a thick consistency. This prepared *dross* is smoked in the same way as prepared opium and leaves a residue in the pipe which is called *second dross* (in the Netherlands Indies *dit-jingko*). The *second dross* is often consumed in very much the same way as the original opium *dross*. It is generally believed that the smoking or ingestion of *dross* is more harmful than the smoking of prepared opium. The reason for it is not known but it is possible that the high alkaloidal content of this substance is responsible for this belief. Failure, partial or complete, to collect the *dross* produced from licit opium thus becomes a serious defect of any

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opium control system and the gravity of the situation is further increased when the *dross* resulting from the smoking of illicit opium is taken into consideration. As a measure in combating the illicit traffic in *dross* the excise authorities in some places have introduced a system of purchasing *dross* produced by smoking.

madak goli is smoked in an ordinary *chillum* or a *hookah*, made of two pieces of hollow bamboo one thick and the other thin. One end of the thin piece is fitted into the thicker piece in the form of a letter V, the free end acting as a mouth piece. Besides the pipe, the smoker requires a brazier, a pair of tongs with a sliding

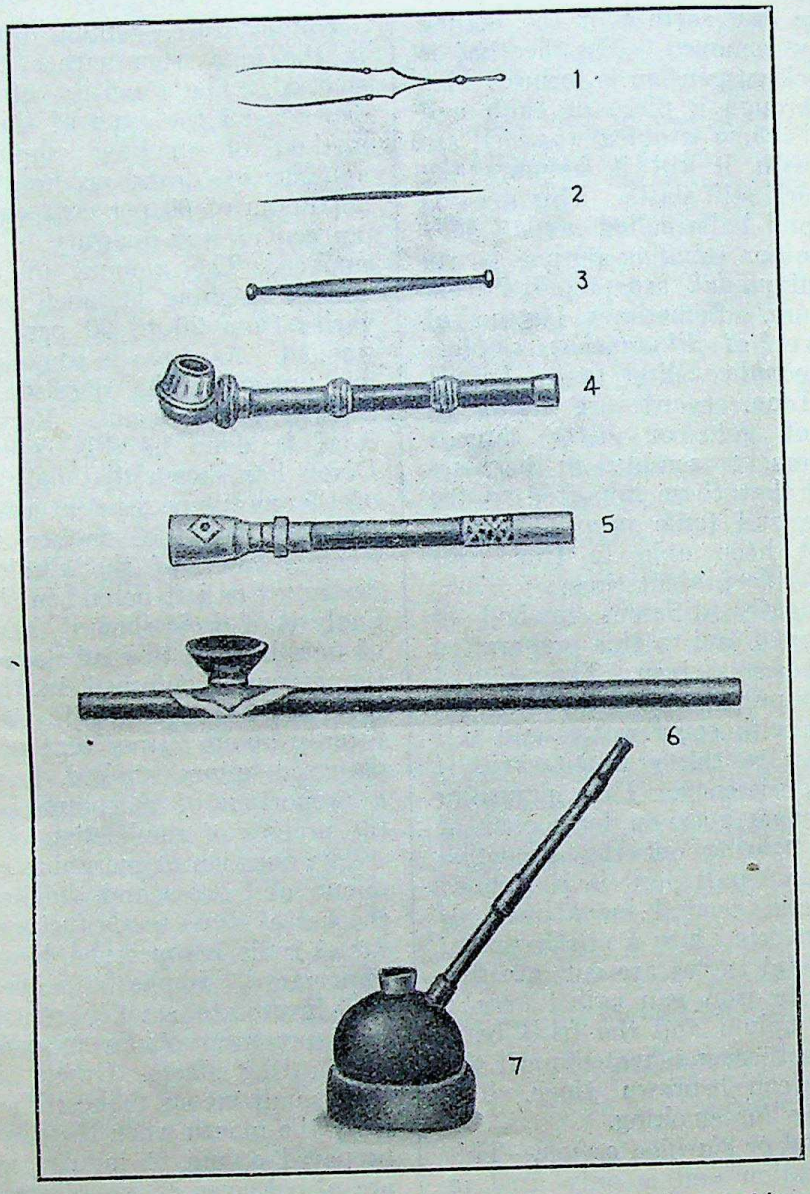

Fig. I.—Showing different kinds of apparatus used for smoking opium in this country.

1. Pair of tongs. 2. A steel stylet or *seekh*. 3. Gouge for removing burnt opium from the bowel of the pipe. 4, 5 and 6 are opium smoking pipes. 7. A *hookah* used for smoking *madak*.

Modes of indulgence.—Different kinds of apparatus have been improvised in various parts of the country for smoking opium. The one commonly used consists of an elongated wooden pipe (made from bamboo or desert acacia), twelve to eighteen inches in length and three-quarters of an inch in diameter. One end fits into a small china or earthenware bowl, and the other end is the mouth piece (figure I, nos. 4 and 5). Sometimes both ends are decorated with thin copper, silver or brass plates or wire. In Assam and in some other parts of the country clamp and a steel stylet (*seekh*) for clearing the hole in the pipe in case it gets blocked (figure I, nos. 1, 2 and 3).

The method of smoking *madak* is simple. The bowl is slightly warmed and the *madak goli* is placed in the bowl. A glowing charcoal is applied and simultaneously several pulls are made through the mouth piece inhaling the smoke deeply into the lungs.

When *chandu* or clarified opium is smoked, the technique is somewhat different. The bowl is at first warmed by holding the pipe over the

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brazier so that the mass of opium placed in it becomes sticky and begins to melt. The temperature to which the bowl is heated is of importance, because, if it is too high, there is danger of the opium melting rapidly, becoming charred, and emitting a disagreeable odour. After the bowl is properly warmed, a small piece of *chandu* or clarified opium is placed on one side of the hole leading into the pipe or just over it. In the latter case a hole is made through the opium mass with the stylet. The bowl is again warmed and, as the opium softens, it is stirred with the stylet until it forms a thick

According to some this is done in order to get rid of the bitter taste of the opium smoke, while others consider that the object is to get the smoke into the stomach to get enhanced effects. Hot tea is generally provided during winter and spring time, but a syrup of lemon and sugar *sekkanjebeen* during summer season.

The method followed by the Chinese and some of the old Indian addicts in Bombay and Calcutta for smoking *chandu* and sometimes for opium *dross* is somewhat different. The apparatus required consists of an opium pipe, a stylet, a lamp and a head rest.

Fig. II.—*Madak* smoking in a *madak* den.

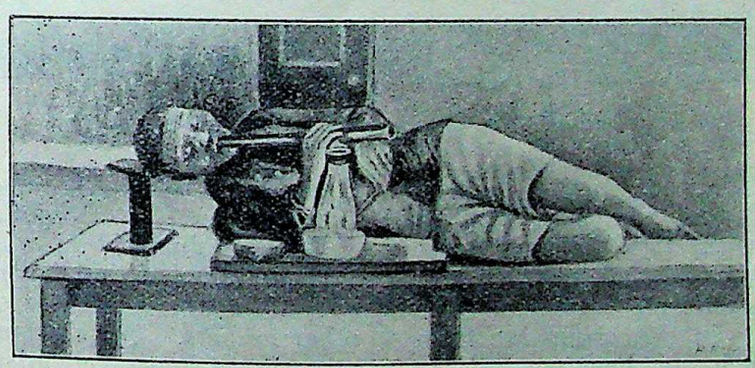

Fig. III.—Apparatus used for smoking *chandu* and an addict smoking this drug.

coffee-coloured mass. A piece of glowing charcoal is then held with the forceps close to the opium and the smoker applies his lips to the other end of the pipe. When the opium is on the point of melting, he actually places the burning coal on it, and gives a few rapid and deep pulls inhaling the smoke into the lungs. The actual process of smoking lasts less than a minute, and then more opium has to be taken if it is desired to continue smoking. The smokers inhale the smoke deeply and after each pull at the pipe sweet articles, such as plantains, sugar-cane, or tea with sugar are often taken.

The dose of *chandu* (prepared opium) is heated at the end of the stylet over a flame, the stylet end being alternately dipped into the opium and exposed to the flame until a little ball of roasted opium is formed on the point of the needle. The needle is then pushed into the pipe head through the little ball of opium thus formed. The pipe is now ready for smoking. The opium mass is held over the flame while the smoker inhales deeply a number of times getting smoke well into his lungs. The actual smoking of this pipe also takes about a minute and the whole process of preparation must be

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repeated for the next pipe. The old smokers generally smoke six to eight pipes at a time after which they fall into what appears to be a peaceful slumber.

Types of addict

Three classes of opium smokers may be described:—

(*i*) *Occasional smokers.*—This class is ordinarily addicted to opium eating, but indulge in a smoke (of a pull or two of *madak* or have a few whiffs at a *chandu* pipe) occasionally when an opportunity offers itself, such for example as when they are in the company of opium smokers. These persons are as a matter of fact aware of the evil consequences of over-indulgence and have enough strength of mind to limit the amount of smoking. Properly speaking these individuals are not active smokers, but may be potential ones who may take up the habit any time when they have sufficient means as their will-power is weakened.

(*ii*) *Regular but moderate smokers.*—The majority of the addicts in this group are from the artisan class, such as hackney-carriage drivers, domestic servants, labourers working in tea garden and forest areas, etc. These persons smoke once or twice a day and are in the habit of consuming up to 20 grains a day. Many of them earn from eight annas to one rupee per day and spend a large amount of their earnings on their dope. They generally smoke in the evening after the day's hard labour is over and it is mostly done in their homes, but may also be indulged in a regular opium den on a holiday. Such addicts are now decreasing in number and in the present series formed about one-third of the total number.

(*iii*) *Regular and excessive consumers.*—This class is very much more numerous than the preceding two classes and comprised more than two-thirds of our cases. The dose in this case ranged from 40 to 180 grains a day. An enquiry made in the areas where the habit is still prevalent showed that most of these addicts belong to lower and mendicant classes who have very meagre means; a few belonging to better classes are generally individuals who have tried all narcotic drugs, such as ganja, charas, opium, alcohol and cocaine, etc. Not infrequently the excessive smokers are morally degenerate and, when they have no money for their usual smoke, beg and commit thefts. Eighty per cent of the excessive smokers in our series were Mohammedans and 20 per cent were Hindus. Hackney-carriage drivers, mendicants and some prostitutes are amongst those who consume large doses and repeatedly indulge in the smoke several times in a day.

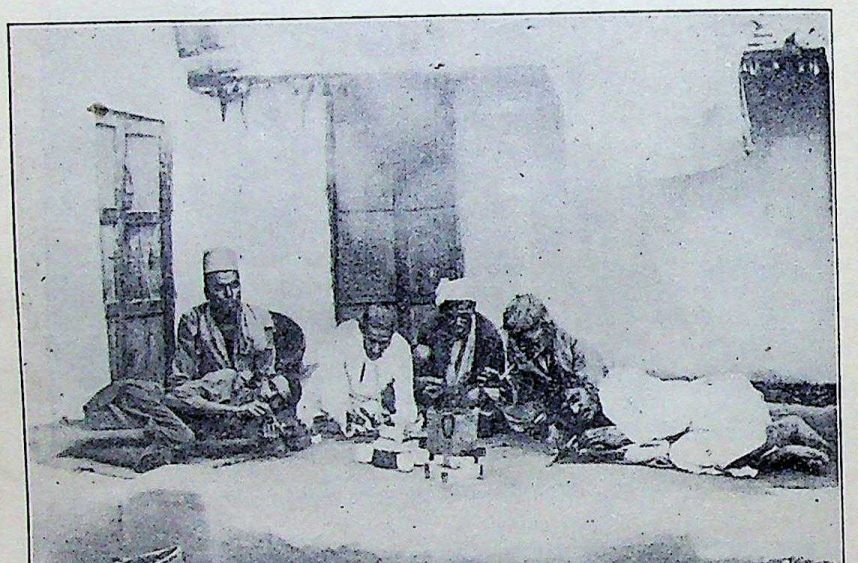

Fig. IV.—Interior of an opium smoking den in Nagpur town.

Smoking establishments and social nature of the habit

Unlike opium eaters, who generally seek solitude in order to indulge in their cravings, the opium smokers prefer to smoke in company of other addicts. For this purpose they assemble at specified hours and in specified places, in the morning, afternoon or evening. It is for this reason that smoking of opium is preferred in organized establishments rather than in private houses. The majority of the smokers do not possess a pipe or other accompaniments required for smoking opium. A satisfactory pipe costs a few rupees and a good pipe much more. On account of these difficulties, smoking dens where all facilities are provided have existed ever since the habit of smoking originated. Smoking establishments are also encouraged by the fact that smokers have no suitable places of their own where they can retire for a smoke. Most of the smokers are afraid to smoke at home as other members of the family are likely to object to it. For the homeless individuals or those

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living far from their homes, a smoking den may be the only place for a night's rest.

The opium smoking establishments in this country are generally dirty, dingy and ill-ventilated rooms located very often in the remote and unfrequented parts of the town. There is little else in these except a few old worn-out mats on which the smokers sit or lie down. There they can smoke the drug unmolested and unknown to their relatives and friends, who might stand in the way of their indulgence. As the place gets known to the addicts it attracts more and more smokers. There are a number of dens in large towns like Bombay even at the present time, though they are often difficult to trace. Generally there is a man in charge who either lives on the premises or at least spends most of his time there. As a rule he is an indigent person who has been an addict for the greater part of his life. He may be a Hindu or Mohammedan according to his clientele and when the latter he is generally addressed as *ustadji* or master. He is generally an old emaciated, pale and anæmic looking individual. He sits on a dirty piece of matting with smoking pipes and some prepared opium which he sells to his clients at a small profit. He may supply ready-made *madak* or *chandu* to the addicts on payment or may merely supply the opium pipe and the necessary equipment. Poor class addicts as a rule buy their dose every time they smoke, but those who can afford it buy the maximum quantity of opium allowed under excise regulations and manufacture their own *madak* or *chandu* as the case may be, portions of which they smoke at leisure. Little or no care is taken to clean, much less to disinfect, the pipes after they are used by smokers and in this way the pipe often serves as a source of spreading contagious diseases, such as syphilis and tuberculosis.

In spite of the restrictions placed by law, opium smokers prefer to smoke in company. The smoker feels happy while he is watching others and is watched by others. All sit on the floor or on a platform. The social distinctions disappear and the smokers take part in the ritual of preparation in the most leisurely fashion and with much good humour. Tea and sweets are brought in and served to all those present. The glowing of the brazier and the manipulation of the pipe are kept up with the utmost relish and enjoyment. All combine to make the sitting as pleasant as possible; there is no hurry and no thought of anything else. This is the sort of 'atmosphere' the smokers like to secure, even though they may be in the dark corner of some smoke-blackened opium den. In places where the restrictions are severe and assembly is not allowed, the smokers frequently meet in the house of one or other of their members and smoke together. There is little doubt that these parties are looked upon with disfavour, because at such meetings young men commonly acquire the habit; and also parties of smokers are not infrequently suspected of being responsible for petty thefts in the village in order to obtain money for buying the drug for a smoke.

Semi-religious and social aspects of the habit

Smoking of opium used to be a common practice in old days at such social gatherings as marriages and funerals in certain parts of Assam. The custom required that opium should be distributed among the smokers who were present on such occasion. Of recent years also a ceremony purporting to be of a semi-religious nature, the *kenia seba* (the serving of opium), has been found to exist among the more ignorant classes in Assam, at which opium addicts assemble and opium is distributed with the object of averting sickness or other troubles sent by Providence. The distribution and consumption of opium was also common at *namgoa* (the name-giving ceremony). These semi-religious uses of the drug are purely the inventions of interested opium consumers and have no authority from the Sastras (religious books). They are looked upon with disapproval by the better classes and are rapidly disappearing.

Madak smoking is stated to have existed formerly on a much more extensive scale when opium was not only more easily available but was much cheaper in price. Certain families are said to have been ruined by the habit. The number of smokers is declining as opium is getting dearer and restrictions against smoking are increased. Opium eating is now found to be cheaper and less troublesome and many smokers are taking to opium eating instead. The average expenditure of a *madak* smoker is about Re. 0-4-0 per day or roughly 180 grains a week and of *chandu* smoking is considerably more, as compared with one or two annas per day of an average Indian opium eater. Owing to restrictions placed during recent years on smoking opium, the opium dens in this country are rapidly disappearing.

Control of the opium smoking habit by Government

It has long been recognized that in India opium smoking stands on a different footing from opium eating. Opium smoking is indulged in almost entirely for its euphoric or pleasure-giving effects, and is a social vice. The danger of its spread, when practised in public, furnishes strong justification for adopting measures which approach as nearly as possible to total prohibition. So far as opium eating is concerned the Royal Commission on opium in 1895 pointed out that as a vice it scarcely exists in many parts of India. This, however, is not true. The Commission found that opium was extensively used for non-medical and quasi-medical purposes, and that it would not be practicable to draw a distinction between them in the distribution and sale of the drug. The Commission considered that it was not necessary that

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the growth of the poppy and the manufacture and sale of opium in British India should be prohibited for all except medical purposes. The Opium Commission also found that the drug was taken in moderation by the average Indian for its mild stimulant effects, as a prophylactic against malaria, for the relief of pain and in the treatment of disease. It was in fact a household remedy for many ills, and it was said that in small quantities eating of opium was less injurious than the consumption of alcohol in many countries in the west. Centuries of inherited experience had taught the people of India discretion in the use of the drug, and its misuse was a negligible feature in Indian life. The above conclusions were also accepted by the Shanghai Commission, who, while they recommended suppression of the practice of opium smoking, refrained from advising the abandonment of the policy of the regulation by which the practice of smoking in this country has hitherto been successfully kept under restraint. The present authors in a previous communication have shown that the habit of opium eating in very small quantities as it exists in some parts of India can scarcely be called addiction or vice and that it does not produce harm.

In 1860, *i.e.*, 34 years after the annexation of Assam, the cultivation of the poppy was entirely suppressed, opium was issued from the treasury alone, and the price was raised in order to prevent its excessive use. Further, in 1925, under the agreement arising out of deliberations of the First Geneva Opium Conference of the League of Nations, India is bound to take measures to reduce the consumption of prepared opium so that it may be completely suppressed within 15 years. Prepared opium is defined as any product of opium obtained by a series of operations designed to transform it into an extract for smoking purposes. Even before this conference, according to the Hague Convention of 1912, all provinces of India were under an obligation to suppress opium smoking. In Assam and other provinces an Opium Smoking Act is in force, which prohibits smoking of this drug.

Under the existing law smoking is subject to very severe restrictions. The sale of the preparations of opium for smoking purposes is absolutely prohibited throughout India, while their private manufacture is only allowed to the smoker himself, or, on his behalf, from opium lawfully in his possession, and to the extent of 180 grains (one tola) at a time. The quantity of opium daily used by an opium eater and the inconvenience and difficulty involved in the repeated preparation for the smoking are so great that these restrictions practically amount to total legal prohibition.

Although this policy of reduction in consumption by raising the price has been followed for the past 60 years, it was found necessary in Assam in 1919-20 to adopt more stringent

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INCIDENCE OF BRONCHIECTASIS IN ASTHMA

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THE investigation was suggested by an accident. A patient who was being treated in the King George Hospital, Vizagapatam, for bronchiectasis suddenly developed a typical attack of asthma. On enquiring into his previous history more minutely it was subsequently found from his relatives that he had suffered from asthma when he was a child of 5. He had this affliction for nearly 3 years. Since then he had apparently been free from respiratory troubles for a period of nearly 25 years. He sought admission to the hospital for the treatment of his present complaint, namely, a cough which he had had for nearly 4 years. This was evidently a case of bronchiectasis superimposed upon, or resulting from, a pre-existent asthmatic condition.

Little mention is made about this subject in the literature concerning bronchiectasis. Ballon, Singer and Graham (1931) who have made a thorough study of the subject do not discuss the relationship between the two conditions, though they give in their ætiological table 2 of their 142 cases as being secondary to asthmatic bronchitis. Hedblom (1931), Kerley (1934), Warner (1935) and others who have also written on the pathogenesis of bronchiectasis do not make any mention of this aspect of the subject.

Fifty consecutive cases of asthma, of duration varying from 3 to 10 years, were therefore investigated to find out the incidence of bronchiectasis in them. Radiographs of the

(*Continued on opposite page*)

(*Continued from previous column*)

measures by way of limiting the supply to shops and further in 1927 steps were taken to limit the supply and ration of all addicts below 50 years and to reduce their consumption to nil within 10 years by means of a 10 per cent reduction in their annual ration. The effect of this policy has already been discussed.

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lungs after lipiodol injection into the bronchi were taken in all the cases. Fourteen cases showed definite evidence of bronchiectasis. Six showed saccular dilatation, five cylindrical dilatation, and three showed early bronchiectasis with tortuosity of bronchioles and slight cylindrical dilatation.

In ten of the fourteen cases there was clinical evidence of chronic bronchitis with asthma. But in all the cases the history was suggestive of the primary condition being asthma.

Being a believer in the inspiratory theory regarding the pathogenesis of bronchiectasis I suggest that during an asthmatic attack there is a considerable increase in the inspiratory pull on the bronchial walls, particularly on those portions which are weak congenitally or weakened by inflammation. The spasm of the healthy portions of the bronchial wall will only accentuate the irregularity of its contour.

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ICHTHYOL AS A TREATMENT FOR GUINEA-WORM

By RAMKRISHNA N. GORE, L.M. & S.

I USED pure ichthyol (Burgoyne, Burbidges) as an antiphlogistic for the resolution of inflammatory conditions with satisfactory results, in place of extract belladonna, the quality of which had deteriorated, during the last war. After a liberal application of ichthyol to the affected part, it is covered with cotton-wool. In a few hours as it begins to dry a contracting effect is produced and the patient feels definite relief.

I therefore tried ichthyol for the resolution of the inflammatory condition in a case of guinea-worm.

The first case treated had severe inflammation of the leg including the knee and a burst papule with an ulcerated surface. The patient was given an ounce of viscid ichthyol to be applied to the whole of the inflamed leg from the knee down to the toes leaving a clear surface an inch round the burst papule, and was told to cover it with cotton-wool. Six doses of a mixture (Alum grs. v, Tr. Lavandulæ Co. min. x, Syrup ʒii, Aquæ, ad ʒi) was given internally three times a day for two days. The next day as the patient felt much relief, the ichthyol application was allowed to remain for a day more. He was told to come the following day after washing the leg by pouring warm water over it, thus dissolving the ichthyol and removing the wet cotton-wool. On the third day the inflammation had greatly subsided and the patient felt much better. The guinea-worm was seen to be protruding from the burst papule and was ligatured. The treatment was repeated and he was told to come again the next day after washing off the ichthyol with warm water as before. By this time the inflammation had completely subsided and the patient felt completely relieved. The dead worm was slowly pulled out like a string.

The second case had an inflamed ankle. He was given the same treatment with equally good results. In the third case the guinea-worm was in the forearm which was inflamed. The treatment was repeated. With the subsidence of inflammation the patient felt relief, and was quite well on the fifth day. In the second and third cases the guinea-worms could be seen and felt underneath the skin but had made no opening through it.

The habitat of the female guinea-worm is the connective tissue of the limbs and trunk. The tip of the tail comes to a point and is abruptly bent, forming a blunt hook, functioning as a 'holdfast'. In the ordinary course the guinea-worm keeps hold by the hook at the end of the tail till the discharge of ova is complete which takes from two to three weeks. It appears to me that with the drying effect of the ichthyol and the resolution of the inflammatory condition, the guinea-worm is pressed between the skin and the muscular tissues and is forced to give up its hold and probably dies. I cannot say if alum has any effect.

In the three cases I was impressed by the results which were quick and uniform. The treatment is simple and cheap, one to one and a half ounces of ichthyol being sufficient for one application. The advantage is that the patient is cured in a very short time, and thus there is also an indirect automatic check to the spread of infection which otherwise would continue for a number of days. The treatment is therefore both curative and preventive.

I am sending this note in the hope that others may be induced to try this form of treatment and thus test its value more fully.

ADULT HÆMOGLOBIN STANDARDS IN BURMA

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THE work described in this paper was embarked upon as being within the scope of a department with little leisure for research, and as likely to be a useful beginning in a field so far entirely unexplored.

The category 'Karens' includes Hills and Plains Karens: the category 'Burmans' has no true ethnological justification (the census of 1931 does not recognize a Burman race as such), but for general clinical purposes is convenient.

The subjects under review were selected virtually at random from the city of Rangoon and from villages within 28 miles. The majority were either 'on trials' at the central jail or students at the University and Medical College. The former group represented a wide range, as

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none of them had been in residence more than a few days, and thus the standard iron intake of the jail diet had not had time to influence the hæmoglobin figures.

All observations were made between the hours of 10 a.m. and 4-30 p.m. by the same individual. Throughout the Hellige hæmometer was used, calibrated by an oxygen-capacity determination. Every possible precaution was taken to ensure that only healthy subjects were included. Ages ranged from 18 to 45, the majority falling between 18 and 27.

The results are expressed in terms of grammes per cent.

As judged by the 't' test, there is no 'significant' difference between the mean for male Burmans and that for male Karens, but the difference between Burman and Karen females is significant.

The usual difference between males and females in both groups is apparent. The data for each category were analysed for age-group differences, but the variance was not significant.

The significant difference between male Burmans in gaol and male Burman students (table II) suggests that a factor in the hæmoglobin content is the standard of living, but further investigation into the homogeneity of the populations sampled is desirable.

The results show that the means are somewhat below the usually accepted figures for Europeans (15.6 grammes for adult males and 13.7 grammes for adult females).

We desire to express their appreciation of the active co-operation given by the various institutions visited, and their thanks to Mr. E. G. Lewis and Mr. D. B. Lahiri of University College, Rangoon, who carried out the statistical work for us.

SPONTANEOUS INFECTION OF GUINEA-PIGS WITH A SPIRILLUM, PRESUMABLY *SPIRILLUM MINUS* CARTER, 1887

By B. M. DAS GUPTA

(From the Department of Protozoology, Calcutta School of Tropical Medicine)

McCLUSKIE (1930), Robertson (1930), Francis (1936), and Knowles, Das Gupta and Sen (1936) have noted the occurrence of *Spirillum minus* in the naturally-infected mouse, *Mus musculus*. The last-named workers cited an incident in which a wrong diagnosis of rat-bite fever was established on the basis of discovery of spirilla in a white mouse inoculated with the blood of a patient suffering from prolonged fever without any apparent cause. It was later observed that the mouse had belonged to a batch of which more than 50 per cent had natural *Spirillum minus* infection. They also showed that inoculation of blood of the naturally-infected mouse into human beings could produce rat-bite fever in these hosts. As young guinea-pigs are also susceptible to *S. minus* infection, these workers examined the blood of 20 guinea-pigs for natural infection with the spirillum. This having proved negative they suggested that young guinea-pigs might be used for diagnostic inoculation in the case of suspected rat-bite fever.

Recently, in the course of my experimental studies on leptospiral infections in guinea-pigs, it has been observed that, out of 42 guinea-pigs examined so far, four harboured natural infection with a spirillum; there were organisms present in fairly large number in the guinea-pigs' peritoneal fluid, although they could not be demonstrated in the blood of each of these four on careful search. The preponderance of spirilla

TABLE I

Class	Sex	Size of sample	Mean	Standard deviation	Range (Mean ± 3 S.D.)
Burmese	Male	100	14.38	± 1.46	10.00 — 18.76
	Female	84	12.23	± 1.36	8.15 — 16.31
Karen	Male	65	14.69	± 1.59	9.92 — 19.46
	Female	37	13.03	± 1.125	9.65 — 16.41

TABLE II

Burmese males

	Size of sample	Mean	Standard deviation	Range
Students	47	14.89	±1.42	10.63 — 19.14
'On trials'	46	13.90	±1.39	9.73 — 18.07

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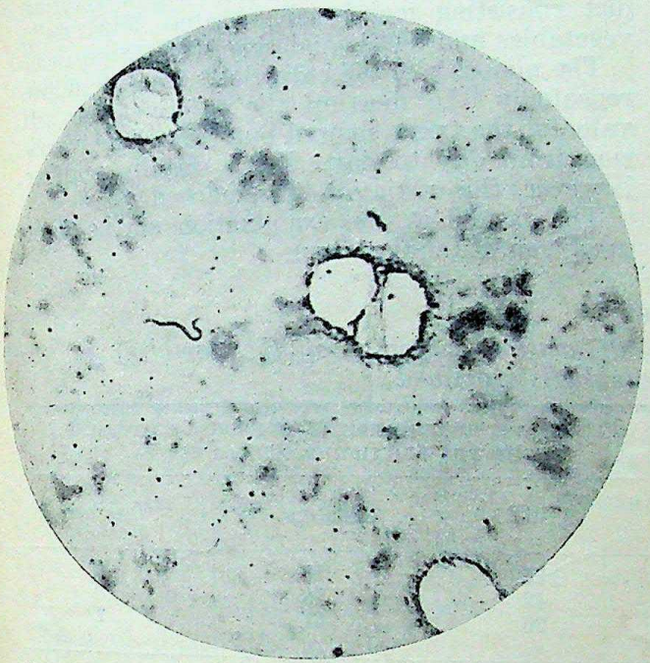
in the peritoneal fluid of mice as compared with the blood has recently been pointed out by the writer (Das Gupta, 1938).

Now that both mice and guinea-pigs are liable to spontaneous infection with spirilla, the only solution that may be suggested is to examine the peritoneal fluid of these animals very carefully on two or more occasions for the presence of natural infection, prior to diagnostic inoculation. Peritoneal fluid can be readily obtained by puncturing the abdominal wall with a fine capillary pipette. The operation involved in this procedure does not in any way upset the animal. The spirillum found in the guinea-pigs



Smear of peritoneal fluid of a guinea-pig experimentally infected with *L. icterohæmorrhagiæ* showing natural infection with *Spirillum minus*. (Photomicrograph × *ca.* 1050.)

varies very much in length. Forms measuring from two microns to anything up to ten microns or even more have been encountered. Its movement is very sharp, shooting forward and backward in a straight line. It is very difficult to study this organism under the dark ground owing to its extraordinarily rapid motility. The terminal flagella can be demonstrated by examination with dark-ground illumination, with an oil immersion objective and a no. 8 ocular after its movement has slowed down, or by staining with the silver-impregnation method. In morphological character the organism is, therefore, indistinguishable from *Spirillum minus*, the causal organism of rat-bite fever. But whether this spirillum has any pathogenic effects on men has yet to be determined.

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THE HYDROGEN-ION CONCENTRATION OF HUMAN FÆCES

By C. L. PASRICHA
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HOWE and HAWK (1912) were the first to determine the exact hydrogen-ion concentration of human fæces. They examined samples of fæces from three individuals and found that the reaction of the material examined by them was always alkaline, varying with the different subjects and conditions from pH 7.01 to 8.77. Nelson and Williams (1916) recorded that 29 of the 30 individuals examined by them passed fæces which were acid in reaction and Rettger and Cheplin (1921) reported similar observations. Robinson (1922) found the pH of the human fæces to range between 7.0 and 7.5. The investigations reported in the literature have been scanty, often based on an inadequate number of observations, and the results conflicting. Except for the observations of Knowles, Napier and Das Gupta (1923) who determined the reactions of dysenteric stools no published data are available on the reaction of the fæces of healthy individuals living on different diets and exposed to tropical conditions.

Freshly-passed stools were collected in sterilized dry bed-pans and care was taken to prevent admixture of urine with the specimen. Suspensions of the stool were made in distilled water adjusted to pH 7.0. The suspensions were standardized to a density which allowed a blue pencil mark made on one side of the tube to be just visible when seen through the suspension. Hellige's comparator was used for the estimation of pH values. The examination was completed within 30 minutes of the passing of the stool.

The stools of 214 individuals were examined and the number of stool examinations on which this report is based is 562. The individuals examined were 165 in-patients of the Carmichael Hospital for Tropical Diseases, forty Marwaris who were in-patients of the Marwari Hospital, and 30 new-born babies from the Eden Hospital.

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The 214 individuals examined belonged to the following main groups :—

I.	Individuals whose dietary was Indian	147
	Bengalis on hospital mixed diet including rice	107
	Marwaris (vegetarian diet with no rice)	40
II.	Individuals whose diet was European	58
	Europeans	29
	Other non-Indians	29

The thirty new-born babies were breast fed and their fæces were examined during the first fourteen days after birth.

The 165 in-patients of the Carmichael Hospital were individuals suffering from a variety of conditions, but not suffering from any apparent intestinal lesions. They were on ordinary hospital mixed diet. Of the individuals examined 107 were on Indian diet (non-vegetarian and including a liberal supply of rice) and 58 on a European type of diet. There was no restriction in the dietary and the actual amount consumed was dependent on the appetite of the individual. In a number of individuals the first stools passed after admission to hospital were examined, and, as no appreciable difference was noted in the results of the examination of these samples and subsequent samples, it may be taken that the results represent the actual findings that may be expected in a sample of the general hospital population. The fæces collected from a small series of individuals in apparently good health were examined and similar results obtained.

The forty Marwaris were on strict vegetarian diet consisting mainly of wheaten flour, milk, vegetables and lentils and very little or no rice.

The majority of the individuals were examined repeatedly. In most of the subjects the pH value of the fæces showed but very slight variation from day to day. In a certain number, however, this variation was marked.

The results of the examination of the fæces are given in tabular form.

TABLE I

The reaction of the fæces (calculated on the result of the majority of the samples) in different groups of individuals examined

Diets	Number of individuals examined	Percentage distribution of individuals according to the reaction of their fæces		
		Acid	Alkaline	Variable
Indian mixed diet (*plus* rice) ..	107	75	16	9
Indian vegetarian diet (no rice) ..	40	42	58	0
European diet (no rice) ..	58	26	67	7

TABLE II

Showing the result of the examination of the total number of samples examined in the different groups

Diets	Number of samples of fæces examined	Percentage distribution of stools according to their reactions		
		Acid (below 7.0)	Alkaline (above 7.0)	Neutral or within the limits 6.9 to 7.1
Indian mixed diet (*plus* rice) ..	356	74	26	7
Indian vegetarian diet (no rice) ..	51	41	59	14
European diet	197	35	65	12
New-born babies, breast fed ..	30	93	7	3.5

TABLE III

Showing the hydrogen-ion concentration of fæces of different groups of individuals

Diets	Number of samples of fæces examined	Percentage of fæces showing different pH values				
		4-5	5-6	6-7	7-8	8-9
Indian mixed diet (*plus* rice).	356	5	34	36	18	7
Indian vegetarian diet (no rice).	51	0	16	25	35	24
European diet	197	3	9	24	48	16
New-born babies, breast fed.	30	10	34	50	3	3

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The examination of the fæces was repeated several times in a number of apparently healthy individuals. In the majority the range of variation of the pH values of the fæces was extremely small, or if there was any marked variation it was of a temporary nature. The following eight individuals however showed wide variations in the reaction of samples of stools examined on different days. No adequate explanation can be advanced for such changes.

TABLE IV

Showing day to day variation in the pH values of the fæces of eight individuals

Serial no.	1	2	3	4	5	6	7	8	9
1	7.8	6.8	6.8	7.2	6.3	8.5	5.1	5.0	..
2	7.3	7.3	6.5	6.0	8.2	..	..	..	..
3	7.1	5.7	6.4	7.0	7.5	..	..	..	..
4	8.1	6.9	7.4	6.7	..	..	..	..	..
5	6.4	6.7	8.1	4.8	8.6	..	..	..	..
6	7.4	5.5	6.1	6.1	7.8	8.0	8.1	7.8	..
7	8.1	7.5	7.8	7.6	7.5	6.9	8.2	8.3	6.8
8	7.9	8.1	7.3	6.9	..	..	..	..	..

TABLE V

Showing the reaction of fæces of different consistency. The results are given as percentage of the number of individuals examined

Diets	THE MACROSCOPIC APPEARANCE OF THE STOOL					
	FORMED		SEMI-SOLID		LIQUID	
	Acid	Alkaline	Acid	Alkaline	Acid	Alkaline
Indian mixed diet (*plus* rice) ..	57	43	75	25	62	38
European diet	—	100	13	87	18	82

It will be seen from the tabulated results that the majority of breast-fed babies examined during the first fourteen days after birth were passing stools which were distinctly acid in reaction. The stools of two babies fed on cow's milk were found to be alkaline. This confirms previous findings.

In European and other non-Indian adults on European type of hospital diet with a comparatively heavy meat intake the reaction of the fæces though somewhat variable tended to be alkaline. The consistency of the stool showed that whereas the formed specimens were invariably alkaline, the majority of the semi-solid or liquid stools were also alkaline in reaction.

The reaction of the fæces of Indians on the two types of Indian diet showed strikingly different results. In the majority of the individuals on hospital mixed diet, which included a liberal supply of rice, the fæcal reaction was definitely on the acid side, whereas in individuals on a strict vegetarian diet with no rice, the fæcal reaction, although in the majority alkaline, tended to be more variable. Although the two diets, the ordinary mixed Bengalee diet and the Marwari diet, are not comparable, the one outstanding feature is the presence of rice in fairly large proportions in the former, and very little or no rice in the latter type of diet. In order to determine the effect of rice on the reaction of fæces the rice was cut off in the diet of four individuals and replaced by ordinary bread. The normal diet of these four subjects was ordinary mixed Bengalee diet including rice and their fæces examined prior to the stoppage of rice were consistently acid in reaction (the average pH was 5.0, 5.3, 5.5 and 6.0). After varying periods (4, 6, 11 and 11 days), the reactions of the fæces became alkaline and remained alkaline as long as rice was excluded from the diet. It appears that the main factor in the determination of fæcal reaction is the diet; a preponderance of carbohydrates produces an acid stool.

Summary

1. The pH of 562 samples of fæces from 214 individuals were determined by the colorimetric method.

2. The fæcal reaction of breast-fed babies was found to be acid whereas those fed on cow's milk were passing alkaline stools.

3. In Europeans and other non-Indian adults on European diet the reaction of the fæces though somewhat variable was alkaline.

4. The reaction of the fæces of Indians varied according to the type of diet. The

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HISTORY OF IMMUNIZATION AGAINST TUBERCULOSIS

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THE isolation and cultivation of the tubercle bacillus by R. Koch gave a great impetus to the efforts to immunize susceptible animals against tuberculosis. The methods of vaccination successfully used in a certain number of bacterial infections were naturally seized upon so as to arrive at the same results in this disease. The discovery of tuberculin by Koch led people to hope that it would be successful in the prevention and cure of tuberculosis. But everyone quickly realized that although it was harmless to tubercle-free animals, it failed to confer the slightest degree of immunity.

F. Klopstock tried to immunize guinea-pigs by injections of gradually increasing doses of tuberculin during several months. On inoculation of the test dose, these animals succumbed in exactly the same way as did the controls. Calmette had the same unsuccessful results in the case of bovines.

I. Strauss thought that a certain degree of immunity could be conferred on rabbits by injecting them every 10 days with very small doses of tubercle bacilli killed by boiling.

Dembinski immunized several rabbits by intravenous injection of increasing doses of killed bacilli (0.00001 gm. to 0.001 gm.). All of these were infected later with 2 mgm. of virulent tubercle bacilli by the intracerebral route. The animals lost weight, but remained alive. Most of them were found to have caseous abscesses in the brain and on the meninges. The resistance conferred was therefore very limited.

A durable immunity could not be produced in guinea-pigs by subcutaneous or intraperitoneal administration of dead bacilli. Borrel demonstrated, in rabbits also, that each injection produced either a local abscess or peritoneal inflammation ending in death.

Calmette and Guérin working with bovines did not succeed in producing a durable immunity by intravenous injections of bacilli killed by heat. Use of bacilli heated only up to 65°C. to prevent an alteration of the protoplasm did not give better results. Even when the bacilli killed by age were substituted for those killed by heat the results were not better.

Petroff reported that injections of dead bacilli could confer a certain degree of resistance on guinea-pigs. It appears that only the onset of symptoms was delayed for a few days.

P. Uhlenhuth also failed to immunize animals by administering big doses of bacilli killed by steam or exposure to 150°C. for 30 minutes.

E. Coulaud incorporated the dead bacilli in melted paraffin and injected rabbits or guinea-pigs by the subcutaneous route. He stated that these animals became much more allergic than those receiving only the dead bacilli in saline suspension. The allergy thus produced endured for 2 to 3 years. These animals, tested by an injection of virulent bacilli, presented signs of disease after a much longer period than the controls. But the resistance was transitory and disappeared by the end of a year, the allergy however enduring much longer. A. Saenz, using vaseline in place of liquid paraffin, came to the same conclusions.

These results lead one to believe that dead bacilli cannot be employed with hopeful results in anti-tuberculous vaccination.

It should be noted that Maragliano since 1903 has utilized bacilli killed by heat in human vaccination. He applies a small amount of concentrated bacillary emulsion in glycerine to a scarified area on the arm. Nathan Raw of Liverpool and Langer in Germany vaccinated children by subcutaneous injection of dead bacilli.

After the experimental failures in the use of bacilli killed by heat the use of organisms treated with chemicals was attempted. Moussu and Goupil used 10 per cent water of Javel, Vallée employed 1/400 dilution of iodine in water, Rappin resorted to fluoride of sodium, Noguchi and later Marxner used oleate of sodium or ammonium, Deycke and Much choline or ovolecithin, L. Rabinowitch formol, and Jousset glycococol. Other workers have used the diastases, such as the juice of Drosera (Loeffler) or certain cellular ferments, protease, lipase, etc. None of these procedures gave satisfactory results.

Bacilli deprived of wax and fats were also experimented with. J. Cantacuzène succeeded in conferring on guinea-pigs an appreciable degree of resistance to the intoxication produced

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majority of subjects on the hospital type of Bengalee mixed diet which includes rice were found to be passing acid stools whereas in Marwaris on vegetarian diet with no rice the fæcal reactions though more variable than in individuals on European diet tended to be alkaline. The exclusion of rice from Bengalee diet and its replacement by bread changed the reaction of the fæces from acid to alkaline.

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by defatted bacilli. He gave a preliminary injection of bacillary bodies treated first by methyl alcohol, then by petroleum ether in a Soxhlet apparatus and finally by a special Gram's iodine solution during 15 minutes. Vallée attempted in the same way the vaccination of calves with the bacilli first washed and desiccated and then defatted by petroleum ether in a flask containing glass beads shaken mechanically for 60 hours. He inoculated 25 to 100 mgm. intravenously, the animals thus treated acquired a certain resistance in regard to an intravenous inoculation of a certain dose of virulent bacilli, which produced death in the controls in a short time.

Louis Martin and Vaudremer employed a slightly different technique for defatting bacilli. The bacilli were first soaked in ether to get rid of water and glycerine, then dried and resuspended in ether for 6 weeks. Guinea-pigs inoculated intraperitoneally with this product were occasionally resistant to lethal doses of virulent bacilli, but the results were irregular.

Afterwards G. Dreyer thought that he could not only immunize but even cure tuberculous guinea-pigs by a vaccine called Diaplyte. He treated the bacilli first with formalin then heated them at 100°C. in a water-bath for 24 hours. The bacillary bodies were filtered and extracted with acetone during 24 hours at 65°C. The last treatment was to suppress the acido-resistance and the colorability by Gram's stain. The bacilli were dried and suspended in distilled water: 1 c.cm. containing 0.2 mgm. of defatted bacilli.

Grasset tried to vaccinate guinea-pigs with this product, but got negative results.

None of the methods so far described gave satisfactory results.

Following all these failures, Maffucci was the first in 1889 to vaccinate bovines with human virulent bacilli. MacFadyean in England, and Pearson and Gilliland in the United States also attempted the same procedure.

The really interesting work was started in 1902 by von Behring, Römer and Ruppel. Their method was known as 'bovo-vaccination' or 'jennerization of bovines' of Behring. It consisted in 2 injections into calves of about 6 months of age by the intravenous route at an interval of 3 months, first 4 mgm. then 20 mgm. of a culture of tubercle bacilli of human origin, which were of very reduced virulence to guinea-pigs.

Many experiments of bovo-vaccination were carried out on cattle, from 1902 to 1910 in Germany, Hungary, Denmark, Sweden, Italy and the United States.

In France a vast experiment was undertaken by the Central Experimental Society of Veterinarians to determine the innocuity, efficacy and duration of immunity conferred on cattle by this method. The conclusions arrived at were as follows : The fairly appreciable resistance presented by the vaccinated animals, tested by an intravenous injection, decreased appreciably after 3 months. The resistance of vaccinated subjects to contagion conveyed by animals with open lesions was little in evidence and disappeared altogether after a few months. The commission also put on record that the bovo-vaccine was of uncertain virulence to guinea-pigs. It could be deduced that the effect on oxen could not be uniform. It was thus well established that the bovo-vaccine of Behring conferred an appreciable resistance on cattle infected naturally or artificially by various routes, but this resistance was of short duration and lasted only a few months. On the other hand, the animals vaccinated in this way eliminated for a long time in their dejecta and especially by their mammary glands, tubercle bacilli with the human character intact. For the individuals taking care of these animals or partaking of their milk, this elimination constituted a grave danger.

In 1905, Robert Koch, Schutz Neufeld and Miessner reported their efforts of immunization of bovines, goats and donkeys with human and bovine bacilli whose virulence was automatically reduced by successive culture in glycerine broth. This vaccine named 'Tauruman' presented the same defects as that of Behring.

After the experiments of the last-named scientist, the most interesting experiments of bovine vaccination were performed by S. Arloing. This author succeeded in culturing human bacilli at 44° to 46°C. in the depth of broth by frequent shaking. The bacilli had thus lost most of their virulence. Inoculated by various routes into small laboratory animals in small doses, the homogeneous bacilli of Arloing rarely produced follicular lesions and were well tolerated by the bovines. S. Arloing used this vaccine in infected rural areas. The tuberculin-negative animals were given two intravenous doses at 3-monthly intervals; no accident was encountered. The test dose of bovine bacilli was given and the animals were sacrificed; after some time 50 per cent showed no lesions on autopsy, 25 per cent had only glands affected and the rest had generalized lesions. The controls injected with the same strain showed the following results:—

Generalized tuberculosis in 67 animals.
Glandular tuberculosis in 27 animals.
Nine animals free from lesions.

In a farm containing 81 per cent tuberculous cattle, 77 per cent of the vaccinated animals did not succumb to the infecting dose. S. Arloing did not determine the duration of immunity conferred by his vaccine, as he died at this stage.

H. Vallée utilized in his vaccination work a bacillus of equine origin which was of slight virulence to rabbits and guinea-pigs. This author stated that the bacillary vaccine suspended in an unabsorbable medium conferred a more marked resistance to tuberculosis than the injection of bacilli as such. He emulsified the

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culture of his bacillus in vaseline, mixing it with talc powder or 'grès phosphorisé'. He hoped thus to assure a longer persistence of his vaccine in the animal body.

The Japanese scientists introduced a new method of vaccination with attenuated living bacilli. K. Shiga obtained a strain of tubercle bacilli of low virulence and easy diffusibility by making successive cultures in glycerine broth containing gradually increasing doses of trypaflavine (derived from a chloride of fuchsin) or neutral red; these chemicals had a distinct inhibitory action on the growth of the organisms. The bacilli thus attenuated were of very slight virulence for guinea-pig. Shiga asserted that these bacilli, sensitized by an anti-tuberculous serum, prevented the extension of latent foci in subjects predisposed to the disease and suffering from glandular tuberculosis.

R. Arima, K. Aoyama and J. Ohnawa suppressed the acid-resistance of a human tubercle strain and attenuated its virulence by culturing on media containing a saponin (extract of *Sapindus mukorogi japonica*). This strain produced only very few small pulmonary tubercles in rabbits inoculated intravenously with doses of 10 to 100 mgm. These authors obtained fairly encouraging results in the vaccination experiments conducted on rabbits and guinea-pigs.

Vaudremer, in his attempts to vaccinate cattle, also employed a strain which had lost its acid-resistance by contact of a Chamberland filtrate of a culture of *Asperigillus fumigatus*.

As we have seen, the work of Behring was responsible for making the world look in another direction in immunological processes; the living bacilli were shown to be much more efficacious than dead. But these ideas did not prove to be of utilitarian value because of the attendant dangers. The same reasons applied to the use of living virulent bacilli, which will be described simply from a historical viewpoint :—

Gerald Webb and W. Williams tried to vaccinate rabbits, guinea-pigs and two infants born of tuberculous parents by injecting repeated small doses of virulent bacilli.

Selter also tried to vaccinate 9 infants with living bacilli. He inoculated them with 10 to 10 thousand virulent bacilli of human type containing the ground-up bacillary bodies. One child died of pneumonia three months after the inoculation but the others remained perfectly well.

Such methods could never be used on a large scale, the subjects thus infected were always in danger of suffering from a generalization of the caseated tubercles; this was shown by Bruyant to be the case in guinea-pigs.

Nègre and Bretey showed that living tubercle bacilli of the S type could be used to confer a marked immunity on guinea-pigs, rabbits and monkeys. But they could not say if these bacilli could become virulent later on, hence their results could not have a utilitarian value.

These experimental observations were in conformity with clinical data.

Marfan showed in 1886 that individuals, who had suffered from glandular tuberculosis in their childhood, rarely suffered from pulmonary tuberculosis later on. The resistance to tuberculosis of adults in big cities was well known. The disease manifested itself in their case in the chronic form and did not advance much. This resistance can be explained by a spontaneous vaccination caused by the ingestion of a few bacilli in their childhood.

Heimbeck and Scheel clearly established that nurses and medical students with a positive tuberculin reaction had very little contact-tuberculosis as compared with those with a negative skin test. Heimbeck observed only two cases of infection in a series of 216 probationers giving a positive cuti-reaction (0.9 per cent). On the other hand, 55 cases occurred amongst 246 negative reactors (22.8 per cent).

It was known that guinea-pigs tuberculized for 3 weeks did not react to a reinfection in the same way as healthy animals. A subcutaneous inoculation of a known virulent strain in the latter caused in about 10 days the appearance of a cutaneous nodule, which ultimately ulcerated and persisted till death. The infection spread to corresponding glands and then generalized.

In the case of the guinea-pigs tuberculized for 3 weeks, a similar inoculation produced at the end of 24 to 48 hours an erythematous patch, which necrosed. The necrosed tissues were eliminated and a scar formed, the infection remaining localized to such an extent that even the corresponding glands escaped.

Allen Krause and Dorothy Peters, Debré and Bonnet have shown that the nodule caused by a reinfection in guinea-pigs previously vaccinated by a strain of low virulence did not progress in the same way as the nodule of a primary infection in a healthy guinea-pig. On intradermal inoculation of a few bacilli in a normal guinea-pig, the nodule did not make its appearance before 8 to 10 days. It ulcerated and the infection generalized. In the vaccinated guinea-pigs, the nodule due to a secondary infection might appear as early as the 4th day. It enlarged up to the 4th week and then retrogressed and disappeared.

On the other hand, Krause and Willis have stated that the subcutaneous injection of a virulent strain in normal guinea-pigs caused a spread to all the organs in 4 days. A similar secondary infection in the case of immunized animals caused the virulent bacilli to remain confined to the regional glands during 15 days. The generalization occurred at the end of 30 days.

Calmette and Guérin observed later on that if a minute quantity of virulent bacilli was administered in food only once to a heifer, it suffered from tuberculosis, reacted to tuberculin during several months, and then recovered. The

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animals which had thus recovered could not be reinfected and behaved like vaccinated animals. But if several doses of virulent bacilli were ingested by a heifer, at short intervals, a fatal infection was contracted.

It was thus shown experimentally for the first time that a single contamination of small importance determined a mild infection and passed off, vaccinating the animals. Whilst several repeated contaminations led to a grave illness, which did not pass off and generally ended in death.

Calmette drew attention to the fact that in early life infants born of phthisical mothers were exposed to grave dangers leading generally to death, because not only was the infection massive but was repeated day by day. The statistics prepared by Calmette showed the following rate of mortality in the first year of life of babies born of tuberculous mothers and brought up with them :—

In France—24 per cent.
In Paris—32 per cent.
In Belgium—20 per cent.

From the third year of life of the babies, the contagion was less formidable, because the little ones were less in contact with their mothers and so infection became more intermittent. Calmette concluded from these data that an early but mild infection in men and animals was desirable on condition that it would not be followed by other infections either massive or following closely one after the other. It conferred on the organism a sufficient resistance against the grave and rapidly fatal form of infection.

In view of all these facts, Calmette was led to the conclusion that it would never be possible to vaccinate adolescents or adults in countries either heavily infected or those in which the bacilli were widely disseminated. The introduction of dead bacilli into the system might be risky, causing the supervening of intolerance or activation of pre-existing lesions.

In his view, a method of preventive vaccination could only be useful when applied to the newly born or to individuals totally free from lesions. The idea of utilization of pathogenic bacilli or of those of attenuated virulence was considered dangerous. Calmette and Guérin sought for the living tubercle bacilli, which were avirulent.

In order to obtain easily emulsifiable cultures, Calmette and Guérin cultivated tubercle bacilli on media containing essentially pure ox bile. They found that, in spite of the high alkalinity of the medium, the bacilli developed well on cooked potato medium containing 5 per cent ox bile in glycerine, the aspect of the culture resembling the colonies of glanders. After 13 years of continual subculture representing 230 passages, the extremely virulent bovine bacillus used became incapable of producing inoculable tubercles in guinea-pigs, even after administration of 1 to 2 centigrammes. In spite of this, it was an excellent antigen and was capable of producing big amounts of antibodies in healthy and tuberculous guinea-pigs. It could be cultivated on the routine laboratory media presenting the normal aspect of tubercle bacilli and produced tuberculin actively.

Sidelights on B. C. G.

The birth of B. C. G. has already been described; we propose to throw some light on its pathogenic and immunizing properties.

Its toxicity as tested by the intracerebral or subcutaneous routes approximates to that of human or bovine tubercle bacilli, but it can be differentiated by its chemical constituents.

Chargaff has shown that B. C. G. is richer than the last two in its total lipoids and in wax soluble in chloroform. On the other hand, the higher alcohols of the wax of B. C. G. are only one-half the molecular weight of those of the corresponding alcohols of the virulent bacilli.

Inoculated by various routes (subcutaneous, intraperitoneal, intravenous, intraocular, subarachnoidal or intracranial) up to 1 mgm. into guinea-pigs and rabbits it did not produce any tuberculous lesions whatsoever.

Stronger doses, 5 to 20 mgm., administered subcutaneously into guinea-pigs caused the formation of a cold abscess, which after evacuation healed spontaneously without the tumefaction of neighbouring glands.

One to 5 mgm. injected intracardially into guinea-pigs caused a hypertrophy of the lymphatic system, which disappeared in a short time.

Intraperitoneal injection of doses more than 5 mgm. in amount caused the formation of tuberculous nodules in the omentum which disappeared altogether in a few months.

In the case of rabbits, intravenous injections of big doses (15 to 20 mgm.) caused the appearance in the lungs of small follicles containing giant cells, leucocytes and epithelial cells which regressed gradually and disappeared completely within 6 months of inoculation (Coulaud).

If one inoculated the peritoneal nodules or lung lesions subcutaneously into guinea-pigs, the inoculated animals never developed any tuberculous lesions.

The bovines, young or old, which do not react to tuberculin, support well the subcutaneous inoculation of 50 to 100 mgm. of B. C. G., which is also inoffensive for monkeys especially the anthropoid apes. The same holds good for horses, goats, sheep, pigs, dogs and the animals lower in the scale.

Normal human beings can be given 1 mgm. subcutaneously without causing the satellite lymph-glands to tumefy. These inoculations cause only the formation of a cold abscess at the site of inoculation.

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The dose of one centigramme given by mouth and repeated thrice at 48-hour intervals in the case of the newly born, and 10 times the dose in young animals on the breast does not cause any physiological derangement. All these data established by Calmette and his collaborators have been confirmed by numerous scientists (R. Kraus, Gerlach, Prausnitz, Kolle, Kirchner, Aldershoff, Stanley Griffith, Lyle Cummings, O'Brien, William Park, Cantacuzène, Bruno Lange, Tzekhnovitzer, George Blanc and the Ukranian Commission). The members of the Bacteriological Section of the Conference on B. C. G., convened in Paris in October 1928, under the auspices of the League of Nation's Health Committee, have recognized these unanimously as exact, and they have also declared that B. C. G. is an inoffensive vaccine incapable of producing a progressive tuberculosis.

Although B. C. G. is harmless to the animals most susceptible to tuberculosis it is a very good antigen both *in vivo* and *in vitro*.

On the other hand, it sensitizes the animals to tuberculin provided they receive a fairly big dose.

In guinea-pigs the rate of appearance of allergy is directly proportional to the dose administered subcutaneously. Tuberculin sensitization occurs in 15 days after the hypodermic administration of 0.001 to 0.1 mgm. The prolongation of the anteallergic period is noticeable if the dose be less than 0.001 mgm.

One centigramme of B. C. G. administered *per os* 4 to 5 times to guinea-pigs does not sensitize them before 35 to 40 days, sometimes it takes longer.

The allergy persists for 6 to 10 months.

In the rabbit, an intravenous injection of 0.001 to 10 mgm. of B. C. G. induces a sensitization which manifests itself at the end of 8 to 15 days. A dose of 0.0001 mgm. or upwards fails to sensitize occasionally. The allergy persists for 8 to 10 months. Administered *per os* in doses of 5 to 10 centigrammes, it sensitizes not earlier than 5 or 6 months.

The horse reacts to an intravenous inoculation of 10 mgm. by a hyperthermia commencing on the 2nd day and disappearing on the 12th. Each new bacillary injection causes an earlier and shorter febrile reaction, the incubation period being never less than 2 hours.

Numerous experiments have been performed to determine if the B. C. G. regains the virulence in the body of inoculated animals. Calmette and Guérin have shown this idea to be untenable in the case of cattle. They reinoculated the heifer with the cold abscess material produced in this animal by subcutaneous injection of B. C. G.; the inoculated animal remained free from lesions. One can therefore conclude that B. C. G. derived from bovines, having remained in the system of the most susceptible animal for a year and reinoculated into the same species, did not regain its virulence.

Calmette and his collaborators also reinoculated guinea-pigs, under the skin or into the peritoneum, with either the epiploic nodules which result from the intraperitoneal injection of B. C. G. or the lungs of rabbits having undergone an intravenous injection of B. C. G. and containing the small follicular lesions described by Coulaud. The guinea-pigs thus treated did not become tuberculous in any case.

The same experiments were conducted by R. Kraus and Gerlach at Vienna, Bruno Lange at Berlin, Stanley Griffith at Cambridge, William Park at New York, Aldershoff at Utrecht, A. Ascoli at Milan, Kirchner at Hamburg, Tzekhnovitzer and the Ukranian Commission at Kharkoff.

Tzekhnovitzer unsuccessfully tried to make B. C. G. virulent by inoculating it into monkeys and guinea-pigs treated either by (*a*) small doses of diphtheria toxin, (*b*) fed on vitamin deficient diet, (*c*) given gradually increasing doses of tuberculin, or (*d*) infected by other germs, *e.g.*, streptococci. Successive passages from animal to animal also gave negative results.

Nègre and Valtis did not have better luck in their experiments. The guinea-pigs infected with 10 mgm. of B. C. G. by the subcutaneous route were repeatedly given subcutaneously 1 c.cm. of acetone extract of tubercle bacilli during 2 months, but the B. C. G. remained avirulent.

On the other hand, Petroff claimed to have rendered B. C. G. virulent by successive passages in the testicle of guinea-pigs. He asserted that he dissociated B. C. G. into an avirulent R type and an S type virulent to the guinea-pig. No other worker has succeeded in confirming these observations of Petroff. It is highly probable that the S colony of Petroff came from a virulent bacillus introduced accidentally into his culture. Our contention is strengthened by the fact that B. C. G. is of bovine origin, the S type should have proved virulent for the rabbit, but such was not the case. It must not be forgotten that Petroff himself supplied the R and S colonies of B. C. G. to Neufeld, who concluded that the S type contained a virulent human bacillus and not a bovine one.

Later on Hormaeche, Sassano and Medlar as well as Dreyer announced that B. C. G. could be made virulent by (*a*) injecting guinea-pigs suffering from a streptococcal infection, (*b*) by culturing in Sauton's medium containing fresh rabbit serum, and (*c*) by cultivating in the depth of peptonized and glycerinated veal broth.

These results could not be confirmed by Boquet, Saenz and Sanctis Monaldi.

It is useless to mention the grave accident of Lübeck, where the experts appointed by the German Government concluded that the vaccine prepared locally had been used to immunize infected children and had been contaminated by a virulent bacillus.

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Certain clinicians have opined that although B. C. G. may remain inoffensive for years, it may ultimately cause tuberculous lesions. These fears are groundless and no experiments have given cause for such fears.

We know that the bacilli used as vaccine are eliminated gradually and disappear without leaving any trace. At this moment, the immunity which was due to the presence of the bacilli in the system also disappears in its turn.

The autopsies of vaccinated infants have not revealed tuberculous lesions. Zeyland and Madame Zeyland have shown that the organs of such babies contained B. C. G., which was found to be avirulent by animal passage.

To sum up, thousands of vaccinations conducted for the last 7 years have established that the general mortality is relatively lower in the vaccinated than the non-vaccinated. It proves that the hypothesis of the regaining of virulence by B. C. G. after a time is without foundation.

Certain authors have wanted to link immunity to hypersensitivity. Immunity cannot exist unless the tuberculin tests are positive. In Koch's phenomenon, the tuberculous guinea-pigs are at the same time hypersensitive and refractory to infection. Koch was of opinion that reinfection did not occur because the bacilli used in the test were destroyed in the necrosed tissues and later eliminated.

Afterwards Calmette, Römer, Bezancon, Sèrbonnes, Rist and Rolland, Debrè and Bonnet, Boquet and Nègre have tried to differentiate immunity and hypersensitiveness in the phenomenon of Koch.

An intradermal inoculation of a small dose of Koch's bacilli into a tuberculous guinea-pig does not produce Koch's phenomenon, but no reinfection actually occurs. Only the immunity intervenes without any manifestation of hypersensitivity (Römer).

But a moderate dose of bacilli injected intradermally into tuberculous guinea-pigs provokes the phenomenon of Koch without any reinfection. Immunity and hypersensitivity manifest themselves simultaneously. It should be borne in mind that the immunity conferred by the bacillary vaccine establishes itself progressively, its slowness presents a great contrast to the rapidity of sensitization.

The guinea-pigs which received 50 to 100 mgm. of B. C. G. subcutaneously reacted to tuberculin on the 5th day, Koch's phenomenon could be elicited at the end of 8 to 20 days and immunity appeared as much as 30 days later.

The bovines vaccinated by an intravenous injection of 50 mgm. of B. C. G. reacted irregularly to tuberculin, were immunized at the end of 6 weeks and ceased to react at the end of 4 to 6 months, but the immunity persisted at least a year.

Dead tubercle bacilli and paratubercle bacilli do not immunize the injected animals but sensitize them to tuberculin.

Immunity and hypersensitivity are therefore two distinct and independent states of the organism infected with Koch's bacillus.

Sensitization to low dilutions of tuberculin proves that B. C. G. is absorbed and retained by the organism. This indicates that the conditions necessary for immunization with B. C. G. are actually produced.

The experiments (detailed below) on small laboratory animals, cattle and anthropoid apes have shown that the B. C. G. introduced by the subcutaneous, intravenous or digestive routes, confers a state of resistance. The resistance varies according to the susceptibility to tuberculosis of the various animal species.

By an intravenous injection into a rabbit of 15 to 20 mgm. of B. C. G., one can protect this animal against tuberculous infection, fatal in 50 to 75 days in the controls. But the resistance thus conferred decreases from the 6th month onwards. The test bacilli remain in the system and produce benign and well-supported lesions. Generalization and death sooner or later are rarely encountered.

Young rabbits, 15 to 20 days old, can be vaccinated by the oral route by administering with a pipette 20 mgm. of B. C. G. 5 to 10 times at 24-hour intervals. Tested 3 months later with a dose of 1 mgm. of virulent bovine bacilli, given in 1 to 2 meals, they survive much longer than the controls of the same age, and present only discrete lesions whilst the non-immunized die of visceral tuberculosis.

Rabbits vaccinated by the intravenous or subcutaneous route react to tuberculin from the 15th day onward and continue to give positive reactions up to the 8th month.

It is possible to confer the same resistance on guinea-pigs by (*a*) an intracardiac injection of 5 to 10 mgm., (*b*) by giving two subcutaneous injections of 50 mgm., or (*c*) by ingestion of 100 mgm. in 10 meals. But it is stated that, as in the case of rabbits, the immunity starts to disappear from the 6th month after vaccination. The adult guinea-pigs, vaccinated by the subcutaneous route, reacted to tuberculin from the 5th day onward, and those immunized by the oral route reacted from the 32nd to the 47th day.

Similar results were obtained in guinea-pigs and rabbits by Imamura and Takahashi, Lange and Lydtin, Okell and Parish, Rancovitz, Rolle, Satake, Tzekhnovitzer and Kochkine.

Calmette, Boquet and Nègre have shown that subcutaneous injection of 2 mgm. of B. C. G., repeated 10 times on alternate days, confers a better immunity on guinea-pigs than a single dose of 20 to 30 mgm. of the bacillary vaccine. Lately J. Beerens has shown that the repeated subcutaneous injections into guinea-pigs (20 to 30 times on alternate days of 0.01 mgm. of B. C. G.) confer a degree of resistance,

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ANTI-MALARIAL MEASURES IN THE RAILWAY AREA AT DELHI

By B. L. CHOPRA, L.R.C.P., M.R.C.S., L.M., D.P.H., D.T.M.
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AN intensive anti-malarial drive was undertaken by the Government of India to rid the Imperial Headquarters of malaria during the summer of 1936 (under the supervision of Lieutenant-Colonel Covell, I.M.S., Director of the Malaria Survey of India).

(*Continued from previous page*)

which cannot be equalled by a single administration of 0.2 to 0.3 mgm. These observations have been confirmed by Ch. Duprez.

L. Nègre has also demonstrated in the case of guinea-pigs that a known quantity of bacilli administered in divided doses, *e.g.*, 5 centigrammes given in 5 doses of 1 centigramme on alternate days, is more efficacious than a single big dose. The percentage of positive tuberculin reactions rises and the resistance to the test dose is more marked. This observation is of great value from the point of view of vaccination.

Working with pigs and goats, Ascoli has demonstrated that vaccination by the subcutaneous route was superior to that by the oral route.

Experiments on cattle have shown that these animals having been given 20 to 30 mgm. of B. C. G. intravenously or 100 mgm. subcutaneously can be safely injected with 3 mgm. of virulent bacilli. The controls injected at the same time die in 3 to 4 weeks with generalized lesions in all the organs.

Wilbert has put in evidence the resistance of chimpanzees and cercopithecus to a virulent infection, these animals having been treated with 50 mgm. of B. C. G. by the subcutaneous route or by 5 centigrammes of the vaccine administered *per os* 5 times in 10 days.

Schlossmann, Tzekhnovitzer, Kirchner and Schneider were unable to confirm these observations.

Kraus and Gerlach have stated that the monkeys vaccinated by the subcutaneous route resist an infection by the application of virulent bacilli on the scarified skin of the eyebrows.

Meyer was able to keep his monkeys to be used for poliomyelitis experiments in good condition by B. C. G. vaccination, whilst the non-vaccinated monkeys contracted tuberculosis.

E. Küster and Elkes vaccinated the macacus *per os* with B. C. G. and observed a manifest resistance to a test injection.

A. Stanley Griffith has also stated that the vaccinated macacus showed a retardation of the progress of the test infection, the lesions being also less pronounced than in the controls.

Old and new Delhi were divided into areas. Medical officers in each local body were responsible for their respective areas. Fortnightly meetings of all the medical officers concerned were held at the Malaria Survey Office, Delhi, where Colonel Covell or Major Afridi, I.M.S. (special anti-malaria officer, Delhi), kept the medical officers fully posted with information about conditions prevailing in the various areas and about any danger spots. The Malaria Survey authorities collected all this information through their men who made daily surveys of all the areas. Different mosquito catching stations were fixed and insect catchers daily went round these stations. The spleen index of most of these areas was also recorded by the Malaria Survey staff.

A summary of the anti-malarial measures within the railway area is given below:—

(A) Measures taken before the onset of the monsoon.

(B) Measures taken after the rains had set in.

(A) *Measures taken before the onset of the monsoon.* Work under this heading was limited as the monsoon had already broken. However, measures were carried out on dry days as follows:—

(I) Filling up of depressions liable to hold rain water.

(II) Draining of bigger depressions containing water.

(III) Connecting up of rows, borrow pits or pools into one big borrow pit and suitably treating the water thus connected.

The main items requiring attention whilst treating such borrow pits were to see that they were entirely free from rank vegetation for about 10 feet around and that proper distribution of crude oil and cresol mixture by spraying from Planter's spray pumps was done. A few of these sprayers were kindly supplied to us by the Director, Malaria Survey of India. The mixture of crude oil and cresol used was the 25 per cent mixture, as suggested by the Director, Malaria Survey.

Paris green was not used very much because the borrow pits treated with this agent could not be easily inspected as it left hardly any tangible signs of the work done by the anti-malarial gang. The crude oil and cresol mixture however invariably left a layer which could easily be inspected any time after the pits had been treated with it. The only time Paris green mixture was employed was after heavy showers of rain which resulted in flooding the pits, as the Paris green mixture had a better effect at such times on account of the thick vegetation around.

Pyrethrum oil mixture was also used in borrow pits as a larvicide with good results.

Attention was paid to the drainage system and to the wells. Arrangements were made to cover all high service tanks and render them mosquito proof.

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Pieces of machinery, scrap iron, etc., in railway yards were stacked so that no lodgements in which rain water might collect were left and in this connection the following instructions were issued:—

(1) Corrugated iron sheets should be stored in a vertical plane or leaning upright.

(2) Rails should be vertical in their long axis or placed horizontal in their natural position. The grooves should never be uppermost.

(3) Pipe bends should have the two ends downwards.

(4) Iron sleepers should have their concave surface downwards. Pot sleepers should be stored with the pot standing upside down.

(5) Hollow engine parts, such as steam boxes, should not be placed so as to collect water.

(6) Empty barrels, drums and buckets must always be stored inverted. Battery jars and cells should be stored mouths downwards.

(7) Water-closet seats and commodes should be stored upside down.

(8) Girders should not be on their sides.

(9) In all such cases where an article is of such a nature as to make it impossible to prevent the accumulation of water, it should be stored in a covered shed.

(10) Where scrap has been gathered to be sold by auction the material should be disposed of before the onset of the monsoon.

(B) *Measures taken after the rains had set in*—

(1) Pyrethrum extract (sold under the proprietary name of Pyrocide 20) mixed with kerosene and pine oil (which had been found to be an effective insecticide spray for adult mosquitoes in Zulu huts in South Africa) was adopted in Delhi with encouraging results. The Director, Malaria Survey, instituted experiments with insecticides for destroying adult mosquitoes in the quarters of four different communities in the Delhi area. (One of the communities selected was that occupying the railway quarters at Subzi Mandhi.) One gallon of pyrocide was mixed with 19 gallons of kerosene oil and one gallon of pine oil. This mixture was used for spraying inside the railway quarters. A small 'Flit' pump was used for the purpose. The quarters were properly closed and no chinks or other possible outlets for mosquitoes were left whilst the spraying was going on. The results were very satisfactory.

(2) A 'dry day' was observed and the following notices were issued to occupants of all railway bungalows, quarters, etc. :—

'*Anti-Malarial Measures, Delhi Area*

In the interests of the health of railway employees, their families and the general public, it is expedient to stop mosquito breeding within railway area by observance of Sunday as "dry day" on which day all bungalow residents, heads of offices and other subordinates will inspect their houses, outhouses, stables and compounds, etc., for breeding places and will look carefully for tins, bottles containing water, choked drains, *gharras*, sumps outside bath houses and in the garden—these will be emptied and thoroughly dried by 9 a.m. on Sunday and allowed to remain so until inspected by the anti-malaria staff the same afternoon.'

Mention of interesting experiments with a man trap may be made here. The experiments are interesting in so far as they afford information as regards the time of evening or night when really the dangerous type of mosquitoes bite human beings and thus one can find out the time when one should take necessary precautions. The procedure was that an observer lay on a bed placed in the open in a bungalow compound. The bed was fitted with two mosquito nets, the inner one being tucked in closely around the bed, and the outer one being capable of being lowered by the observer when he saw any mosquitoes alighting on the external surface of the inner net. An assistant then came and collected the mosquitoes. The outer net was $10' \times 7' \times 7'$ and was wide enough to allow the assistant easily to go round the bed in order to catch the mosquitoes which had been trapped by lowering it. Collections were made at least every two hours, the first being at 8 p.m. and the last at 6 a.m. The experiments were repeated on a number of nights but could not be carried out except when the weather was clear and there was no wind.

My thanks are due to the chief medical and health officer, N. W. R., Lahore, for permission to publish this article.

A Mirror of Hospital Practice

ANGINAL PAIN IN A CASE OF MALARIA

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MALARIA has been mentioned as one of the causes of angina pectoris.

P. Retzek in a series of lectures on angina pectoris described some characteristic cases of malarial angina and quoted the opinion of Gaskel that 4 per cent of malarial cases result in cardiac death due to coronary thrombosis. This thrombosis may be precipitated by an acute attack, previous chronic malaria having produced endarteritis.

The incidence observed is very high and is probably based on cases infected with Italian or African strains of *Plasmodium falciparum*. James and others (1932), on observations of

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several strains used for therapeutic malaria, had also come to the conclusion that Indian strains of *P. falciparum* were much less likely to produce severe complications than the other strains. Bass had described malarial pseudo-angina. On the other hand, although angina may not be prominent, severe cardiac involvement may be the actual cause of death in many comatose cases of malaria, which are generally put down as cerebral malaria. Cases have been observed in which a deep coma was accompanied by marked cyanosis, enlarged soft liver and rapid feeble heart. The cerebro-spinal fluid was not under tension and showed no increase in cells or proteins. In spite of quinine injections these cases have rapidly sunk and died, strongly suggesting a cardiac failure rather than a medullary one.

Von Engel (1925) has described a similar case of a male, aged 24, who died in coma with a pulse rate of 130 per minute and very feeble heart sounds. Sections of the heart showed severe malarial thrombosis and cloudy degeneration of the muscle.

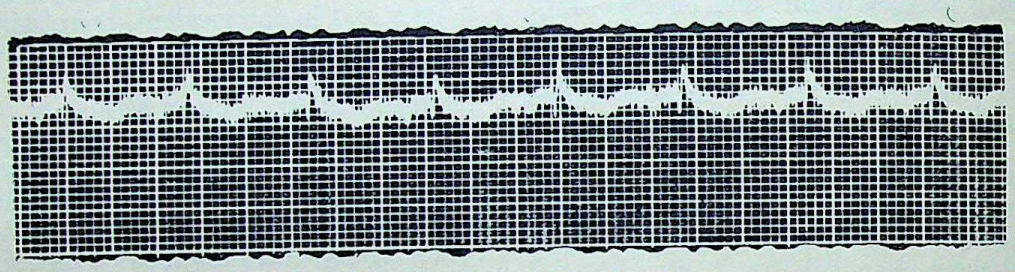
Brosius (1925) has also described a case of cardiac malaria in which marked cloudy swelling of cardiac muscle resembling that of acute diphtheria was found at autopsy.

Micheletti (1929) has described vascular thrombosis with fragmentation and necrosis of the cardiac muscle.

Another affection which is capable of producing anginal symptoms and is found in cases of chronic malaria is dilatation of the first part of the aorta. Benhamou (1926) and Giauni (1929) who have noted such dilatations are emphatic that it is not due to aortitis. Yet it is likely that acute thrombosis of the *vasa vasorum* of the aorta may produce anginal symptoms. Very few electrocardiographic studies in malaria have been published. Although some abnormalities have been noticed characteristic curves of coronary thrombosis have not been obtained.

The patient, G. S., a railway coolie, aged 35, was referred on the 18th May, 1936, to the hospital by the railway doctor for severe pain in the precordial region, palpitation and breathlessness of sudden onset. He had fever with rigors for two weeks, fifteen days before but was afebrile and able to attend to his work till the onset of pain.

Lead I.



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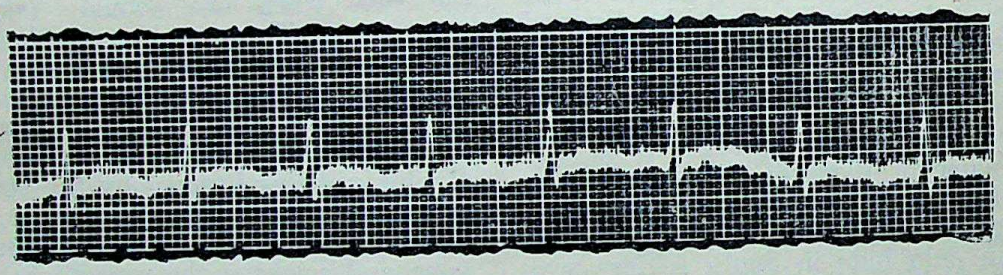
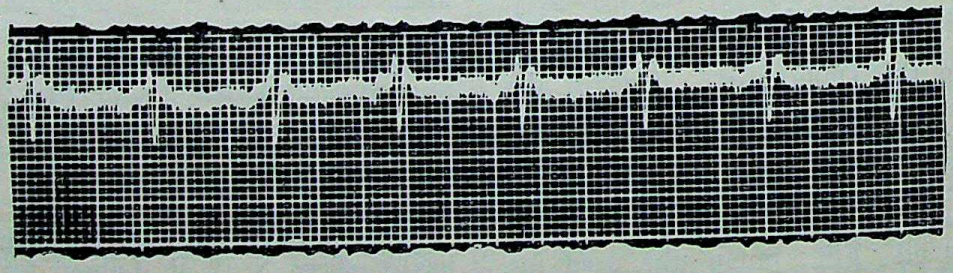


Lead III.



Examination.—Marked restlessness, eyes deeply congested, no rigidity of neck. Kernig's sign negative. Abdomen slightly full and tympanitic, spleen not palpable.

Chest.—Pain in the lower sternal and epigastric region. No radiation. Lungs—prolonged expiration with rhonchi. Pulse—120 per minute. Respiration—40 per minute. Temperature—101°F. Blood pressure 90/40. Leucocytes—3,000 per c.mm. Differential count—polymorphonuclears 62, eosinophiles 4, hyalin 8 and lymphocytes 26 per cent. Blood film showed very large number of *P. falciparum* gametocytes. Ring forms were comparatively few. Widal reaction—negative, blood culture for bacteria—negative. Wassermann reaction—strongly

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positive. The temperature rose to 104°F. No coma; breathlessness increased giving rise to cyanosis. Quinine was given intravenously.

Next day the temperature was normal. The pain completely disappeared. Heart sounds feeble. Lungs clear. The temperature showed two lesser elevations on two more periodic intervals. The pulse rate was still about 120 per minute though the temperature was normal.

On the 25th May, 1936, the patient had another attack of pain and breathlessness. Examination revealed impaired percussion note, feeble breath sounds and fine râles at the left base in the axillary region. There was no significant rise of temperature. The area spread, and on the 28th a distinct rub was felt over the affected area. All clinical signs as well as breathlessness completely disappeared next day. Further progress was uneventful. The blood pressure on the 4th June was 100/60 and the pulse 90 per minute. The pressure after five days was 110/60. Wassermann reaction repeated on the 9th was faintly positive.

There was no history of syphilitic infection nor any clinical manifestations of it. The first positive Wassermann reaction may be that rare condition, a false positive Wassermann reaction, due to malaria.

An electrocardiogram was taken three weeks after the onset, when the systolic blood pressure was 110, and the pulse rate 80 per minute.

Lead I showed a distinct low voltage with a well-marked plateau after the S.

Lead II showed a sharp Q, a biphasic RS and a distinct slurring of S in places, almost a bifurcation and a prominent angular T.

Lead III was similar to lead II, but less prominent.

It distinctly pointed to cardiac infarction of few days' standing. If it had been possible to take the earlier records, the changes would have been still more striking.

Discussion

The pneumonic signs are suggestive of several conditions. Like the heart condition they might be of malarial origin. Karve (1926) from Kenya has described primary and secondary pneumonias of malarial origin. These, as in the present case, are characterized by uncontrollable pleural pain, transitional râles and short duration. But the onset of the symptoms after the disappearance of the parasites from the blood makes the malarial origin unlikely.

A ward infection can be ruled out by the extremely short duration of the signs and symptoms and absence of leucocytosis.

Reflex atelectasis with formation of mucus plugs similar to post-operative pneumonia has been described following an infarction of the heart. Donzelot (1934) has described fleeting pneumonic signs as a late complication of infarction of the heart due to embolic showers. The lung condition was probably one of the last two.

Summary

A case is described in which severe anginal pain, cyanosis, rapid pulse and low blood pressure marked the onset of a malarial attack.

The infection was not heavy and there was no evidence of thrombosis in other organs such as the brain.

The pulse rate remained rapid and the blood pressure was low for two weeks after the attack.

Acute pneumonic symptoms of very short duration occurred soon after, but these are not considered to be of malarial origin.

The Wassermann reaction was positive during the acute attack.

Acknowledgments

Our thanks are due to Lieut.-Colonel S. S. Vazifdar for his kind permission to publish this case and to Dr. B. B. Yodh who kindly undertook the electrocardiographic investigations.

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PRONTOSIL IN PYELO-CYSTITIS AND ERYSIPELAS

By Y. SURYANARAYANA RAO, L.M.P., L.T.M.

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IN view of the encouraging reports that are being published in the medical journals about the action of prontosil in streptococcal infections, it may be of interest to record its beneficial action in the following two cases, one of pyelo-cystitis and the other of erysipelas, that were treated in the Government Royapuram Hospital, Madras, four months ago.

1. *A case of pyelo-cystitis.*—A patient, a male, aged about 28 years, was admitted into the above Hospital on the 16th February, 1937, with a history of fever and pain over the hypogastric region for eight days.

There was nothing worthy of note in the family history. His habits were regular; he neither drinks nor smokes. No history of exposure to any venereal infection.

As regards his previous history, he had occasional attacks of burning sensation during and after passing urine in the year 1928.

Present history.—On the night of 8th February, 1937, while he was travelling in a train, he had high fever which rose to 104°F. by the next evening. Thinking it to be malaria, he took 20 grs. of quinine sulphate that day. The temperature came down to normal on the morning of the 10th; from the evening, however, he began to pass urine in small quantities frequently accompanied by burning sensation and griping pain. He had also pain in the loins.

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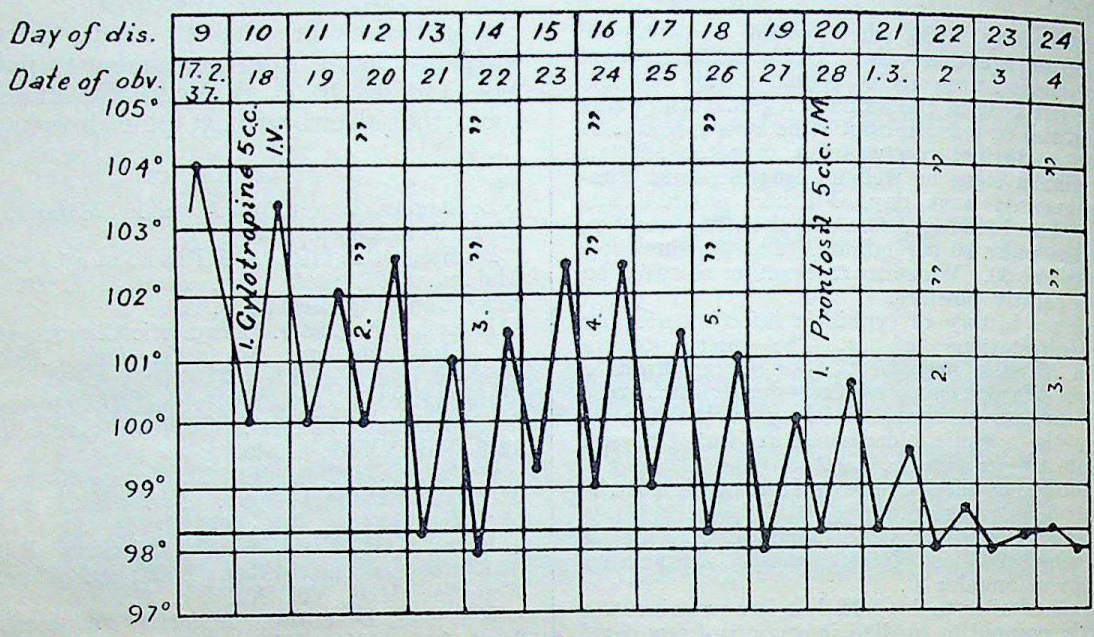
Present condition.—The patient was a fairly well nourished young man. He was having a temperature ranging between 102° and 104°F. Peripheral blood did not show any malarial parasite. There was a slight increase of polymorphonuclear leucocytes.

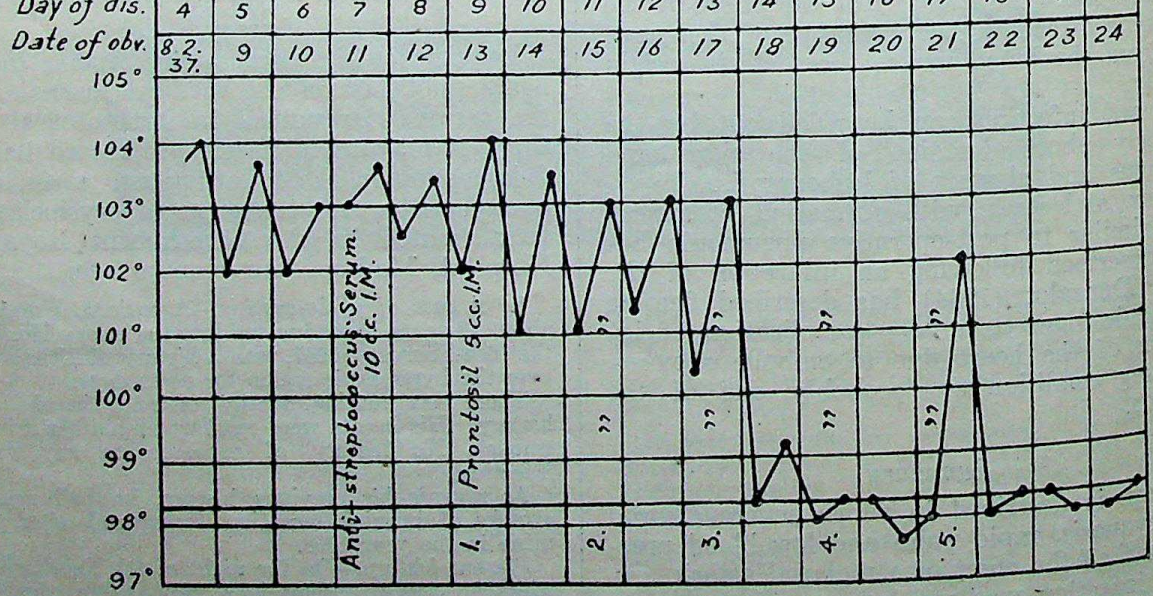
Name.....V.P.N. Age.....28.



Urinary system.—There was pain during micturition. There was no urethral discharge, even after prostatic massage. The reaction of the urine was alkaline, slight trace of albumin was present, no sugar, and the urine was cloudy in appearance. The urinary deposit under the microscope contained plenty of pus cells and a few red blood cells. There were no casts. A three-glass test revealed that all the specimens were uniformly cloudy in appearance and contained pus cells. There was some granular debris present. The deposit also showed some epithelial cells from the pelvis of the kidney and also from the urinary bladder. The urine on culture showed *Bacillus coli.*

On the 18th February 5 c.cm. of cylotropine was given intravenously and it was repeated on the 20th, 22nd, 24th, and 26th. From the 20th, he was also put on mandelic acid treatment. It was given in the form of elixir ammonium mandelate. When the reaction of the urine was found to be not sufficiently acid for the drug to act, by the methyl red test, the patient was given additional doses of ammonium chloride by mouth. This at once increased his burning sensation while passing urine, but it did not bring the reaction of his urine anywhere in the neighbourhood of 5.3 pH which is necessary for the success of mandelic acid treatment. So this treatment had to be discontinued. In spite of five intravenous injections of cylotropine, the temperature did not show any sign of abatement. Then on the 28th the patient was given an intramuscular injection of 5 c.cm.

Name.....K. Age.....18.



On the 2nd and 4th March, prontosil was repeated. The temperature came down to normal and kept normal till he showed steady improvement both as regards the fall of temperature and in the general and local symptoms. The burning sensation in the urine decreased considerably. On the

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was discharged on 15th March, 1937. The patient had no burning sensation. The urine was clear and did not contain any pus cells nor any *Bacillus coli*.

This case shows the beneficial effect of prontosil in infections other than streptococcal.

2. *A case of erysipelas.*—A female, married, aged about 18 years, was admitted into the Government Royapuram Hospital, on the 8th February, 1937, for fever and headache for seven days. Her previous history was that she had fever for about eight days a month back; and that she was in this hospital for fibrosis of the lungs one and a half months back.

The present complaint started with high fever which was continuous for the past seven days. She was a thin individual and of delicate health. Pulse was rapid but full. Liver and spleen were not enlarged. Urine was quite normal. Respiratory system did not show anything in particular beyond a few crepitations here and there. Peripheral blood did not show any malarial parasites but there was distinct increase of polymorphonuclear cells. On the day of admission she was found to have an erythematous patch very slightly raised above the surface, about two inches in diameter, over the front of lower third of the right leg. The part was tender and painful. Thinking it might be localized lymphangitis, lead and opium lotion was applied. But the fever continued high and the local lesion was increasing. Widal reaction for typhoid group of bacilli was negative. As the swelling and redness in the right leg began to increase and the temperature persisted, 10 c.cm. of antistreptococcus serum was given intramuscularly on the 11th. This also did not have any effect, either on the temperature or on the local condition. So, on the 13th, prontosil 5 c.cm. was given intramuscularly. By this time the local redness had spread up to the knee, and the patient was in a toxic state. There was retention of urine and she had to be catheterized. Next day, there was a definite improvement both in the general and local condition. Prontosil was repeated on the 15th and 17th. The temperature came down to normal, and the local condition was definitely better. The patient was given two more injections on the 19th and 21st. By this time the erysipelas inflammation had completely disappeared and the temperature came down to normal, and since then the patient made an uneventful recovery and was discharged cured on the 3rd March.

The above two cases were admitted under Captain Rao Bahadur P. Krishnaswami, B.A., M.B., C.M., M.R.C.P., first physician and superintendent of the hospital, and my grateful thanks are due to him for going through these notes and also for permission to publish them.

[*Note.*—In case 1 the temperature might possibly have subsided without prontosil.—EDITOR, *I. M. G.*]

SALYRGAN IN PHLEGMASIA ALBA DOLENS

By R. L. SONI, M.B., B.S., F.R.H.S.

Paungde and Nattalin, Burma

ENCOURAGED by the favourable results produced by salyrgan in the treatment of various generalized and localized œdemas, I was led to use the drug in a case of phlegmasia alba dolens, the thrombotic form of which is essentially a variety of localized œdema brought about by femoral thrombosis towards the end of the puerperium. The beneficial influence exerted by the drug in relieving the condition prompts me to record the case :—

Mrs. K., a banker's wife, aged 21, had her first confinement on the 5th April, 1937. The delivery was complicated by an extremely unusual obstetric emergency, namely separated symphysis pubis, and so naturally damage to the soft parts was great. The child was born dead, hæmorrhage was severe, the perineal tear was large and deep reaching the rectum, and anteriorly a large retro-pubic niche was formed by the separation of soft structures which had fallen back.

The puerperium obviously could not be uneventful. She had a very bad time but serum, prontosil, liver preparations, tonics together with properly planned local dressings and careful nursing, controlled the situation. On the 14th day she had serum sickness which was followed by a generalized mild œdema. Anæmia which had developed during the puerperium was severe. Calcium, sulphate of iron, campolon and oral hepatex were used. Œdema rapidly cleared in the rest of the body but the left foot continued getting worse. On the 20th day the foot was markedly swollen and pitted on pressure. Next day the swelling extended higher and in another day the thigh was tense. Temperature rose a little and there was slight rigor, but pain in the calf and thigh was intense and even slight movements were resented. On the 23rd day the foot and leg were large and still pitted on pressure; the thigh was swollen, tense, hard and very painful. Novalgin one to two tablets a day in divided doses was given. The leg was fomented, gently wrapped in cotton, put at rest on pillows and immobilized with side-pillows. In addition to the blood-building measures already in progress she was given salyrgan 1 c.cm. intramuscularly, with the idea of draining away the localized œdema. The response was gratifying inasmuch as a profuse flow of urine brought about an appreciable reduction of the œdema of the foot and leg within 24 hours, though the swelling of the thigh did not appear to be noticeably affected. The pain was less relieved than the œdema. Encouraged by the result another injection of salyrgan was given on the 26th day. It was followed by a steady improvement, but on the 29th day though the temperature came to normal and pain and hard stiff swelling of the thigh was getting less, œdema of the foot was once again noticed. She was given ammonium chloride grs. 15, t.d.s., and with the morning dose salyrgan was administered orally (1 c.cm. of a 10 per cent solution) on the 30th and 31st days and 2 c.cm. on the 32nd and 33rd days. By the 35th day œdema of the foot had disappeared and the tense swelling of the thigh had gone down to a marked extent. By the 40th day even the thigh was clear.

Comments.—In the presence of anæmia, puerperal sepsis, pelvic cellulitis and other complications it was not surprising that phlegmasia alba dolens should occur. In this case the thrombotic and lymphatic forms co-existed. The reduction in the œdema of the foot and leg that followed the administration of salyrgan by injection was marked. That it was brought about by salyrgan was clear from the profuse diuresis that attended its use. To control the œdema that recurred on the foot it was decided to try the drug orally, as the patient, having become tired of so many injections, resented even ordinary pricks at this stage. Salyrgan administered together with ammonium chloride brought about a rapid improvement in four days. The efficiency of salyrgan appears to be not appreciably depreciated by oral administration. Fleckseder (1931) used it orally and rectally with good results.

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The condition of phlegmasia alba dolens is known to take several weeks and sometimes months to clear. In this case it took only 20 days. Though the associated measures (nursing, campolon, tonics, etc.) must have done their respective parts, the effect produced by salyrgan in draining the œdema was definite and it appears was a useful factor in accelerating the cure.

Summary.—A case is recorded of phlegmasia alba dolens in which salyrgan was administered parenterally and orally with benefit.

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A CASE OF SCARLET FEVER

By BALKRISHNA N. MEHTA, M.B., B.S.

Medical Officer, Juvansinhji Dispensary, Bhavnagar

ON the tenth day of illness I was called in consultation to see a female patient aged about 20 years.

Previous history.—Ten days ago she felt ill and had pain in the throat and was feverish. Next day an eruption was noticed on the face. It was red, punctate and then confluent and spread all over the body within four days. Desquamation started on the eighth day.

She was in bed with a temperature of 101°F. and pulse 120 per minute. The rash spread from head to foot and desquamation had already started. For the most part it consisted of fine scales, while on the palms and soles large flakes—complete glove-like casts—were about to be thrown off. The pharynx was very congested. The tongue was thickly furred and flabby, but not typical of scarlet fever. The lymphatic glands under the right jaw were enlarged and tender; they had been enlarged on both sides, but the left ones had subsided. No enlargement of the liver or spleen was felt. There was no respiratory complication. Cough was slight and pharyngeal in character. There was a great deal of itching all over the body. The maximum temperature was 104°F. The patient was delirious at night. There was a history of passing blood in the urine. The bowels were constipated.

The urine which was examined on the twentieth day contained no albumin or casts. The temperature gradually came down to normal on the twenty-second day; however, it remained fluctuating between 98°F. to 99°F. for about eight days more. Prontosil by mouth was given from the fifteenth day.

The patient had had measles in her youth. The diagnosis of scarlet fever was made from the character of the onset, the type of rash and its desquamation.

During twenty-four years' practice I have only seen three cases of scarlet fever; all were females. The first one, a Parsi woman, was seen ten years ago and survived. The second one, which proved fatal, was seen last year.

[*Note.*—Although very suggestive it is possible that this disease was not scarlet fever because it is atypical in several of its manifestations. It may have been a toxic erythema induced by a septic infection of the throat. If other similar cases had been noted in the district at the time the diagnosis of scarlet fever would have been rendered much more likely. It is difficult to understand how a single case of a very infectious disease could arise without a history of contact with earlier cases and how it was not followed by others, especially in a community that would almost certainly be highly susceptible.—Editor, *I. M. G.*]

PROBABLE RING CARCINOMA OF THE DESCENDING COLON; MANGO FIBRES OBSTRUCTING THE RING AND CAUSING COMPLETE OBSTRUCTION

By S. R. GORE, L.M. & S.

Honorary Surgeon and President, The Hubli Co-operative Hospital Society, Hubli

N. N. P., age 45, was admitted into the hospital on 16th June, 1937, for intestinal obstruction.

History.—She had pain in the left iliac region on 12th June, 1937. The pain was attended with vomiting and constipation. Since 14th June she had absolute constipation. She was given a soap-and-water enema by the sub-assistant surgeon of the nearest dispensary when she passed a little hard stool; after this there was no further stool or passage of flatus.

Her abdomen was distended but not tense when she was admitted. Temperature—98.4°F., pulse—98, and respiration—30 per minute. Soap-and-water enema given in the hospital had no effect.

Immediate laparotomy was done under spinal anæsthesia and the cause of the obstruction was found to be a hard ring carcinoma at the junction of the descending colon and the sigmoid. The constriction was band-like and hard and it was found to be connected with some enlarged glands adjacent to the mesentery. The gut proximal to the stricture was enormously distended. As it was found impossible to do a side-to-side anastomosis a resection of the tumour with the glands *en masse* and an end-to-end anastomosis were done, after making an incision on the antimesenteric border of the collapsed sigmoid to make it fit the distended gut above the stricture.

The patient made an uninterrupted recovery and was discharged on the 9th July, 1937. She has had no more trouble up to the present and she attends the out-patient department occasionally for inspection.

The specimen is preserved. On inspection, it was found that a mass of mango fibres was blocking the constricted lumen of the gut which was just large enough to admit a lead pencil. There was no history of any pain or other symptoms previously and the patient considered herself quite normal up to 12th June, 1937, when pain started. The inner surface of the ring is not ulcerated. The general condition of the patient was quite good, there was not the least trace of cachexia. I have diagnosed this as cancer on account of its hardness and the hard associated glands. There being no means for making a section, microscopic pathological investigation could not be carried out*.

*It should be an easy matter to send the whole or part of the tumour to a pathological laboratory for confirmation of the diagnosis.—EDITOR, *I. M. G.*

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DRY CUPPING AND ITS SEQUEL*

By A. K. DUTT GUPTA, M.B., D.T.M.

Resident Surgeon, Medical College Hospitals, Calcutta

THE patient, a female, aged 30 years, was in the habit of burning paper and charcoal (*Tika*) inside a large *lotta* and putting it, mouth downwards, over the lower part of the abdomen for relief of pain. This she did many times, kept it on for 2 to 3 hours and removed it without difficulty. On this occasion she could not get it off and after herself trying for several hours called in assistance. It was stated that the combined efforts of three men failed to remove it. Next they called in a doctor, who advised that an opening should be made in the pot to let in air. A cut about half an inch in length was made but still the pot could not be removed. After this an attempt was made to divide the *lotta* into two portions by a horizontal cut, but it failed as the tools available were not good and the bowl was very thick.

The woman came to the hospital two days later. The skin of the abdomen, as seen through the opening, was bluish with one or two black spots. The swelling was very tense and œdematous and projected for about four inches above the skin level. With extreme difficulty a finger could be pushed between the neck of the pot and the swelling but there was a fear that if distended gut was inside the swelling it might burst. It was impossible to divide the rim of the pot. The hospital *mistri* was called in to divide the vessel into two halves along the opening already present; his instruments failed to make much impression, but an opening large enough to admit the fingers was made (figure 1).

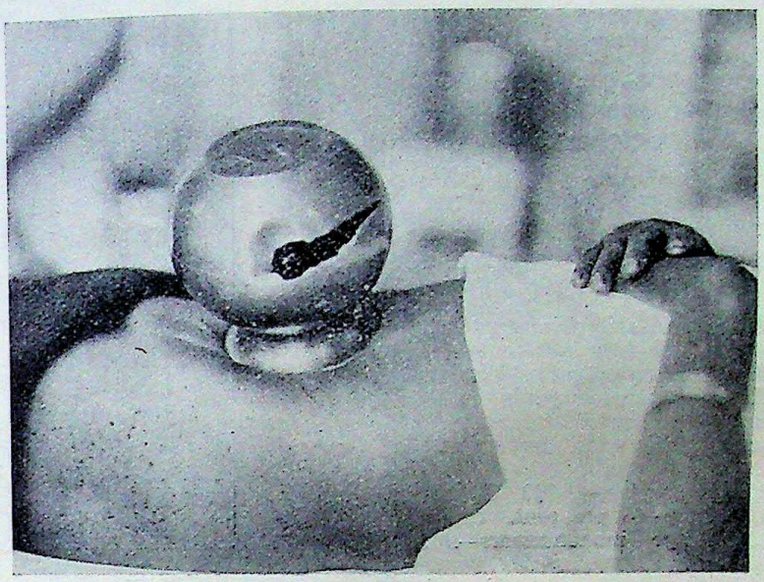

Fig. 1.—Before removal the tense swelling is not so apparent due to want of illumination inside. Most of the black area is the affected part.

Fig. 2.—After removal—showing the affected part.

The patient was anæsthetized and a quantity of thick sterile oil was poured into the pot over the abdominal swelling. A thick pair of linen gloves were put on over the ordinary rubber gloves and a finger was insinuated externally between the swelling and the fairly sharp and irregular rim of the pot, and another finger was inserted through the opening to help the other finger. After half an hour of careful manipulation the pot was removed. The area of the skin that

* Abridged by the Editor.

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was inside the pot measured 8 inches by 6 inches (figure 2). The patient made an uneventful recovery.

The pot weighed 2 pounds, 11 ounces, height $6\frac{1}{2}$ inches, circumference $18\frac{1}{2}$ inches. The mouth was $4\frac{1}{4}$ inches and the rim (narrowest part) $2\frac{5}{8}$ inches in diameter. The opening made in the side was $4\frac{3}{4}$ inches in length.

A SUB-PHRENIC ABSCESS

By S. C. DAS GUPTA, M.B., B.S.
Assistant Surgeon, Jamshedpur

A MALE of poor physique, aged about 22 years, was admitted into the Jamshedpur Sub-divisional Hospital on 27th October, 1937, for treatment of 'acute abdomen' with fever, vomiting and jaundice. His condition was not good at the time of admission. He gave a history of dysentery some time back but nothing else of importance.

He had an abdominal facies, and a hard mass which appeared to be continuous with the liver was found in the epigastric region. It was tender and movable with respiration. The liver dullness extended upwards to the level of the 5th rib posteriorly on the right side.

Temperature 99°F., pulse feeble and rapid, and respiration 21 per minute.

Blood examination:—Total leucocytes—24,000. Differential count—Polymorphonuclears—95 per cent. Small mononuclears—5 per cent. Large mononuclears—nil. Eosinophils—nil.

A provisional diagnosis of liver abscess was made and an exploratory laparotomy was decided upon but could not be performed as the condition of the patient was not good enough.

At 4 p.m. of the same day, he complained of a very sharp pain in the abdomen, and in about 20 minutes' time he collapsed and died.

Post-mortem examination: Clots of blood mixed with yellowish-white pus were found mostly in the upper abdomen behind the stomach and to a less extent over the intestines. All the structures were matted together. No lesion was found either in the liver, stomach, or other organs in the neighbourhood. There was ulceration on the lower part of the posterior surface of the left lobe of the liver but no abscess cavity.

The point of interest of the case is its close resemblance to liver abscess.

A RETRO-PERITONEAL SUPPURATING DERMOID IN THE REGION OF THE KIDNEY

By M. G. KINI, M.C., M.B., M.Ch. (Orth.), F.R.C.S.E.
Surgeon
and
P. KESAVASWAMI
Radiologist
King George Hospital, Vizagapatam (S. India)

RETRO-PERITONEAL dermoids in the region of the kidney are rare and their mode of origin is speculative. Ewing classifies them under 3 heads:—

(1) Tridermal teratomas.

(2) Epidermal rests derived from the Woolfian duct.

(3) True dermoids derived from imperfect closure of abdominal folds.

A female child was admitted in 1932 with a sinus discharging pus on the left side of the back of two years' duration. The sinus was found to go to the region of the kidney and the pus had a peculiar mawkish odour. On *x*-ray examination, in the region of the kidney a dense crescentic shadow was found below the first rib on the left side. Her kidney function was found to be within normal limits. On operation the sinus was found to lead to the region of the kidney and on going deeper hairs were found. A diagnosis of a dermoid cyst was made and it was removed. The dissection of the cyst was difficult as it was fixed to the posterior abdominal wall and diaphragm.

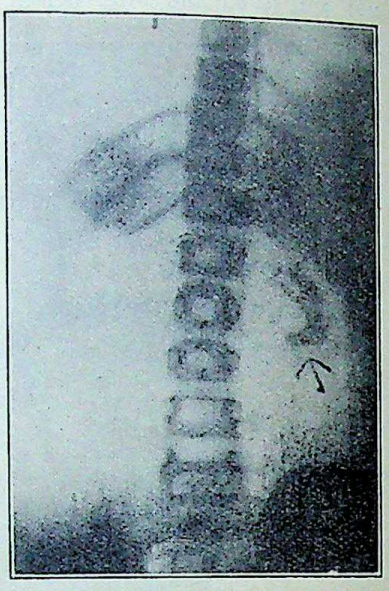

Fig. 1.—The radiograph of the lower thorax and abdomen showing a dense shadow in the region of the left kidney.

Fig. 2.—The photograph of the specimen removed at operation.

On removal, the tumour was found to be kidney-shaped measuring three inches in length, two inches in width and two inches in thickness. The major part of the tumour contained fat and weighed three and a half ounces. A piece of calcified cartilage about the size of a quarter of a circle of two inches radius was also found. The upper and lower ends of the tumour consisted of skin with long hairs hanging from the ends. The patient was discharged with a sinus and she reported subsequently that the sinus took one year to heal and now it is completely healed and she is keeping perfect health.

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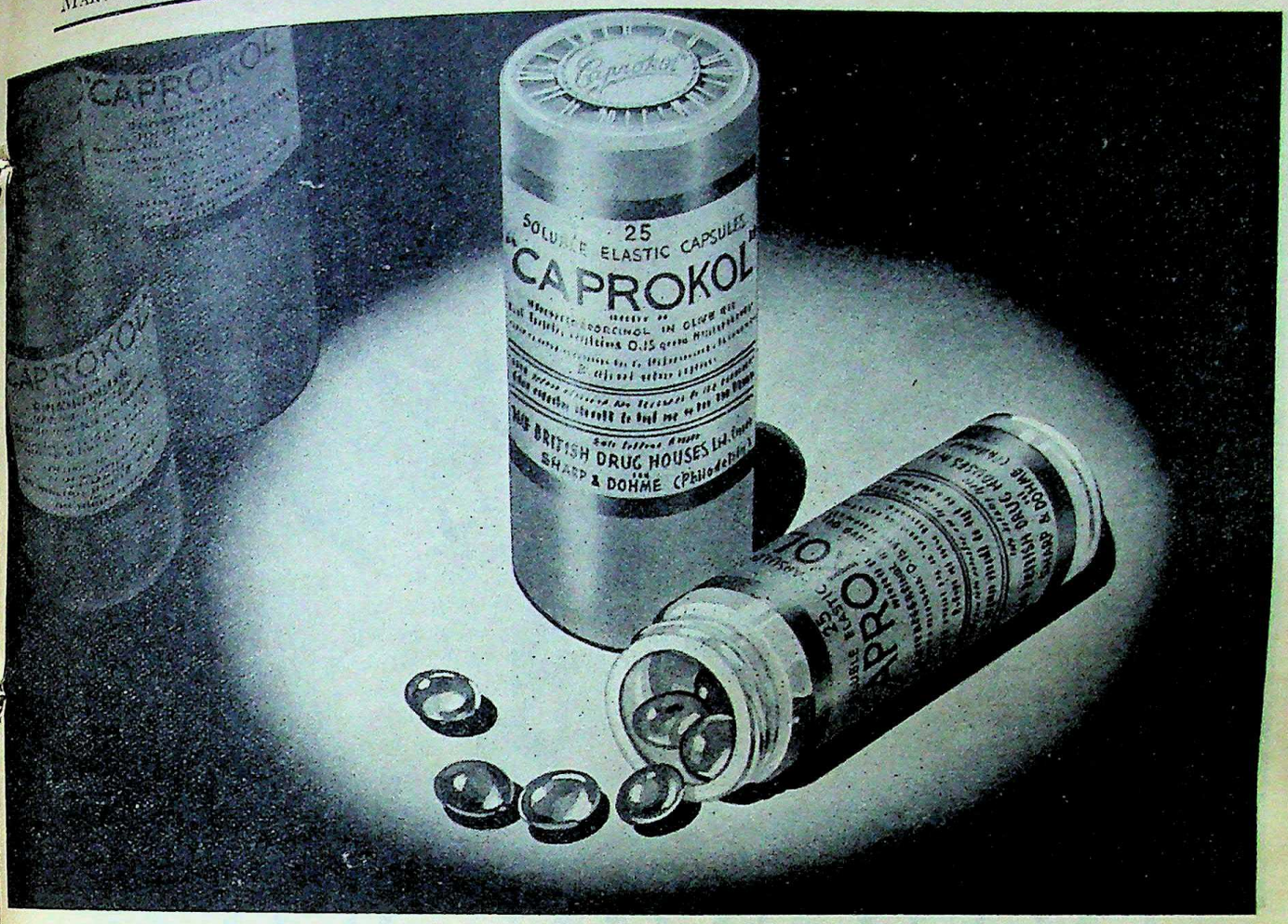

CAPROKOL

(Brand of Hexylresorcinol)

Caprokol holds a unique position among antiseptics prescribed for the treatment of urinary infections.

On administration orally, it passes through the stomach and is absorbed in the intestine; finally it is excreted by the kidneys in sufficient quantity to convert the urine, whether acid or alkaline in reaction, into an actively germicidal solution.

Furthermore, Caprokol treatment is not contra-indicated in cases of renal damage; indeed, by reason of its power to impart a soothing analgesic effect upon the mucous membrane of the whole of the urinary system, the administration of Caprokol is of real value in the relief of the painful symptoms which often accompany urinary infections. For this same reason Caprokol treatment is adopted as a routine, in order to establish a condition of ease and comfort in the elderly patient.

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THE BRITISH DRUG HOUSES LTD.

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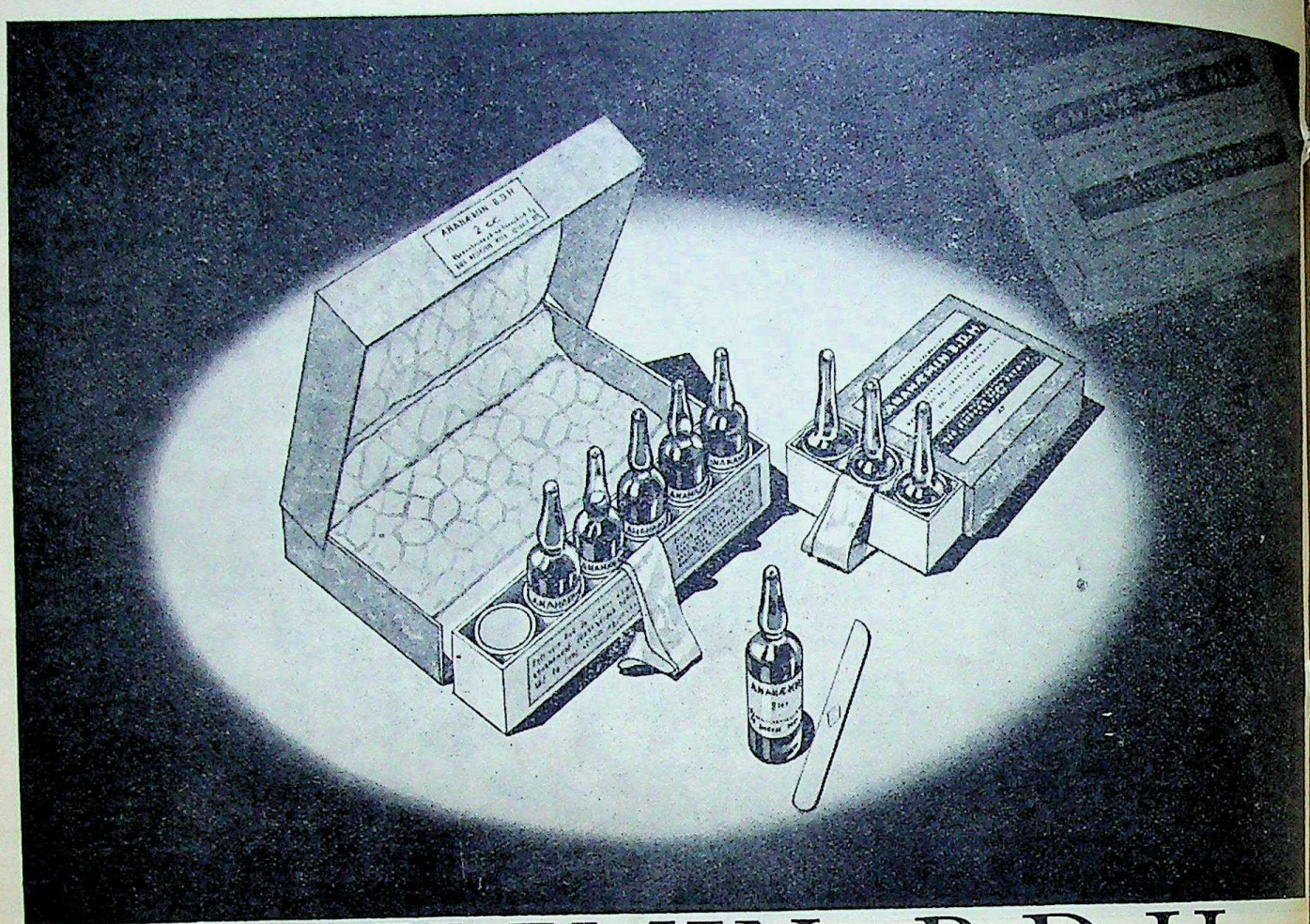

ANAHÆMIN B.D.H.

In the treatment of pernicious anæmia

In the majority of cases of pernicious anæmia treated with Anahæmin the response is so certain that, in the words of one well-known physician, 'it is possible almost to guarantee a rise of half a million in red blood count weekly from a weekly 2 c.c. injection....indeed, this dose seems usually to be too large..'

On the other hand, some physicians arrange their own scheme of dosage; one such physician states 'I give 4 c.c. in a week leaving off all treatment for about six weeks... I have had excellent results . . . Anahæmin has never let me down . . . it is easily the best liver preparation.'

In either event, whether the orthodox or a special dosage be adopted, the blood count in average cases is restored to normal within a few weeks, after which period it can be maintained by monthly injections of 2 c.c.

Full particulars of Anahæmin B.D.H. are obtainable from :

Henry S. Clark & Co.
3 Waterloo Street
Calcutta

Byram Mistry
Premchand House
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THE BRITISH DRUG HOUSES LTD. LONDON
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Indian Medical Gazette

MARCH

DISASTER AND ITS MORAL

At a time when daily newspaper reports of air raids on open towns and the deaths of hundreds of innocent victims of internecine wars in distant-parts of the world are almost ignored, it is interesting to study what will stir the imagination of the public and what particular kind of disaster is required to arouse their indignation.

A report of thousands of deaths from chronic disease certainly will not, though an epidemic may, for as long as the death and incidence rate continues to rise. Disasters to air-liners will affect the tranquillity of comparatively few, in fact such news rather pleases the majority, as it gives them an opportunity of reiterating their already expressed intention of never travelling by air and, by comparison, gives them an extra feeling of personal security; more will be alarmed at the loss of an ocean-going liner; but when a railway train leaves the lines a public enquiry is instantly demanded, and for months is a subject of double-column headline news. Yet, what would have happened had by some pure chance such a disaster been averted at the last minute? Though the bad organization, the defective track, or the dangerous condition of the rolling stock or engine was still known to exist, the incident might have been given half-a-dozen lines at the bottom of the news page and possibly have led to a departmental enquiry, but no more. No, the days of human sacrifice are not past, *vox populi* demands inexorably the sacrifice of far more human victims than any of the ancient gods, before it will be stirred into action, and further it demands that its victims shall be killed in dramatic circumstances.

We have repeatedly drawn attention to the dangers associated with the present uncontrolled state of the drug trade in this country. A state of affairs in which any unprincipled person can manufacture and sell as a nostrum to a gullible public almost any worthless or dangerous substance. He does not have to satisfy anyone even as to its possible efficacy, or, still worse, as to its safety; he can maintain secrecy as to its content or even make misleading statements about this. Such nostra can be sold directly to the public without a prescription from or reference to a member of the medical profession. In fact, the stage is set for a first-rate tragedy, but until it is played right through and the curtain has fallen on the bloody scene, with the bodies all laid out in a row and counted, we fear the public imagination will not be moved, and no action will be taken.

It is not possible for us to learn something from other people's mistakes, or must the disaster occur at our own doors? There have been casual references in the public press in this country to the 'sulfanilamide elixir' disaster in the United States, an incident which has certainly made a deep impression on the public in that country. The story is, shortly, as follows:— A firm of drug manufacturers prepared a mixture which they labelled, ironically, 'elixir of sulfanilamide', and issued it to the public through pharmacists and the medical profession in at least a dozen of the southern states of America; of those who took this mixture on their own initiative or on the advice of their doctor, up to 11th November last year, 73 had died, apparently as a direct result of taking this 'elixir'.

After the first few patients had died and suspicions were aroused as to the cause of their deaths, every endeavour was made, by extensive publicity in the press and by broadcasting, to warn the public and to trace the bottles of 'elixir' that had been issued, but it was too late to prevent the death roll from reaching these considerable proportions.

Sulphanilamide is a potent substance and it has been repeatedly pointed out that, in our present state of knowledge regarding its reactions when combined with other drugs, it should be administered alone or with bicarbonate of soda, but the pharmacological investigations that were immediately instituted showed that it was not the sulphanilamide itself, which had in this instance undergone no detrimental change, but the vehicle in which it was dissolved to make the 'elixir' that was at fault; the manufacturers had used di-ethyl glycol, a substance which hitherto has not been used for oral administration and is known to be toxic in the doses they advocated, as reference to chemical and medical literature would have shown them had they investigated the matter. These pharmacological experiments, which could just as well have been carried out by the manufacturers themselves, *before* they issued their 'elixir' to the public, showed that di-ethyl glycol alone, without the addition of sulphanilamide, given in comparable doses to animals produced death and pathological lesions which were parallel to those produced by the 'elixir' in man.

Is it conceivable that any firm of drug manufacturers for the sake of monetary gain could be so callous as to prepare, issue, recommend the public to take, and importune doctors to prescribe a substance whose death-dealing properties they had made no attempt to investigate? Is it conceivable that the law is so inadequate that it does not compel drug manufacturers to test such drugs before they issue them to a trusting public? Is it conceivable that any qualified chemist should be so irresponsible as to hand over to a customer this potential—as far as he knew, and in fact actual

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—poison? And, worst of all, is it conceivable that any medical man should be so unscientific and so utterly negligent of his patient's interests as to give him or recommend him to take a preparation, not only the therapeutic properties but, the very composition of which he was in entire ignorance?

The answer we are afraid is in each instance in the affirmative. Inconceivable as it may seem, it was so in America and it is so to-day and every day in India. The unscrupulous drug purveyor not only exists, he flourishes. The law of the land gives us no protection against his dishonest and dangerous practices, whether he prepares his drugs in this country or sends them to us from abroad. How many pharmacists question the *bona fides* of the drugs they sell provided they are in an attractive and fresh packing? Does every physician take the trouble to ascertain that the brands he is prescribing have been properly tested, do what they are claimed to do, and do not contain some toxic ingredient. If a doctor prescribes a pharmacopœial preparation and the dispenser gives the patient something else, then admittedly it is not the doctor's fault, but if he prescribes a patent medicine, a secret nostrum or even a non-pharmacopœial proprietary preparation, just because by the morning post he had received a cleverly-worded pamphlet, which hailed it as a great scientific discovery, or because some loquacious and plausible young man had thrust a sample into his hands, then he is immediately taking responsibility on his own shoulders.

This he may be quite prepared and quite right to do; so many of our most valuable drugs are proprietary preparations, but these are accepted drugs that have been scientifically tested by independent workers and though not in the *British Pharmacopœia* are to be found in the *Codex* and such publications as the *Extra Pharmacopœia;* they are made and put on the market by reliable firms who have large testing and research laboratories behind them.

What then are we to do? We can but add our voices to the general demand that legislation with regard to the control of the drug trade be pushed forward with the utmost expedition; the bill that is at present before the central legislature is on the right lines but only touches one aspect of the matter and future legislation will have to be much more comprehensive. In the meanwhile, as the physician cannot test for himself every drug that he prescribes, he must limit his prescriptions to the simpler pharmacopœial preparations—and even these are not adequately protected in this country—or use the drugs made by firms with established reputations.

There are many commercial organizations, in this and in other countries, who have made great contributions to pharmacological research and who are far too jealous of their good names to risk putting on the market any drug that has not been most elaborately tested from all points of view, and in the absence of any state protection the physician is compelled to turn to such organizations to safeguard his patients' and his own interests.

Special Article

THE SPECIFIC TREATMENT OF MALARIA

(BEING A RÉSUMÉ OF A LECTURE)

By L. EVERARD NAPIER, M.R.C.P. (Lond.)
Professor of Tropical Medicine
School of Tropical Medicine, Calcutta

THE first point to be realized is that the treatment of malaria is not a subject about which one can be too dogmatic. The writer's experience has been mainly in this country, but he has visited a number of other eastern countries, studied the work of others in these countries and realizes that in no two countries is the problem really the same. This paper will therefore be applicable mainly to the treatment in India of malaria caused by Indian strains of plasmodium.

Let us first of all analyse our aims in treatment, and we must consider treatment in the widest sense, that is, treatment to prevent, as well as to cure, the disease. The objects that we hope to achieve by specific drug treatment—and it is only this aspect of treatment that will be dealt with—can be placed under five headings:—

(*i*) *True causal prophylaxis;* by the administration to the person who is exposed to infection of a drug that will destroy the sporozoites injected by the mosquito before they enter the red cell and commence their intra-corporeal cycle.

There is at present no drug which will achieve this. Ten grains of quinine given daily for five days before and nine days after a person has been infected by a mosquito will not prevent the development of the parasite, nor will atebrin in full therapeutic doses followed by a daily dose of 0.1 gramme. And in an experiment carried out in London, in which some half-dozen well-known malaria workers took part, three daily doses of 0.02 gramme of plasmochin (a dose which will sometimes produce toxic symptoms) were given for one day before and six days after the infective mosquito bite, and yet five out of six of these men became infected.

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The introduction of a drug that will act on the sporozoites will mark a great advance in malaria therapy.

(ii) Clinical prophylaxis; by the administration of a drug that will prevent the infected person from suffering from an attack of clinical malaria, but without necessarily destroying all parasites in that patient.

Now this *can* be done. A dose of 0.2 gramme (three grains) of atebrin given twice a week, or a daily dose of six grains (five grains are sometimes insufficient) of quinine will usually keep a person free from clinical malaria, even in a very malarious place, for an almost indefinite period. A large-scale experiment has recently been carried out in Malaya in an estate labour force. In one group every one was given atebrin on two consecutive days during the week—adults had a dose of 0.2 gramme each day and children correspondingly small doses, as shown in the table below. In another group six grains of quinine were given daily to adults, and children were given smaller amounts, as shown in the table.

Ages : years	Atebrin : grammes	
1 to 2	0.025	or 0.1 g. euquinine (1½ grains).
3 to 4	0.05	or 0.2 g. euquinine (3 grains).
5 to 6	0.075	
7 to 8	0.1	
9 to 10	0.125	or 0.2 g. quinine bihydrochloride.
11 to 12	0.15	
13 to 16	0.175	or 0.4 g. quinine bihydrochloride.

A third, control, group received no specific treatment. The results of this prophylactic treatment are shown in the figures (1 and 2) (Field, Niven and Hodgkin, 1937).

It will be seen that in the atebrin series the malaria was controlled almost immediately and only an occasional case occurred: in the quinine series the control of the malaria was slower but eventually the fever was largely controlled.

The important point however is that, even in the atebrin group, they were only kept free from fever *as long as the atebrin dosage was continued;* this dosage did not, however, produce *true causal prophylaxis* and did not eradicate the malarial infection completely, but kept it at a sub-clinical level, so that when the drug was discontinued a very large number of the patients suffered a clinical attack of malaria almost immediately and nearly 80 per cent within two months.

This is shown in figure 2 below which gives the malaria incidence month by month for more than a year. It will be seen that, when in the control group there were nearly forty cases monthly, in the atebrin group there were none, or only one or two. However, directly the prophylactic treatment was withdrawn the

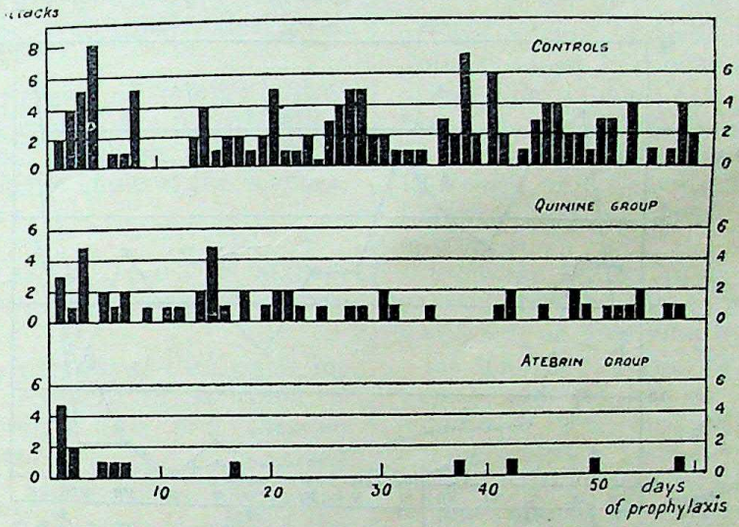

Fig. 1.—Immediate effect of prophylactic measures.

incidence in the atebrin group rose to 37 and was actually higher than in the control group.

(iii) Treatment of the clinical attack.—In the very great majority of cases this can be brought about by the administration of atebrin, quinine, or standardized cinchona febrifuge (B. P. totaquina standard) by the mouth.

If atebrin is used 0.1 gramme (or 1½ grains) should be given three times a day for five days—or in severe malignant tertian infections this may be continued for seven days, but not longer.

The daily dosage for children should be :—

1 to 2 years	..	0.05 gramme
3 to 4 „	..	0.075 „
5 to 8 „	..	0.1 „
9 to 12 „	..	0.2 „
13 to 16 „	..	0.25 „

If cinchona or quinine are given, the prescriptions should be :—

℞
Totaquinæ (or cinchona febrifuge) gr. x
Acidi sulphatis dil. .. .. min. xx
Magnesii sulphatis .. .. gr. xxx
Aquam chlorformi ad .. ℥i

or

℞
Quininæ sulphatis .. .. gr x
Acidi citratis .. .. gr. xx
Aquam chlorformi ad .. ℥i

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One of these should be given twice daily in benign tertian infections and three times daily in malignant tertian infections and this dosage should be continued for seven days.

In the very great majority of instances oral administrations will be sufficient and effective. The reason for this is that when the drug is given by the mouth to a healthy person it is absorbed by the gastric mucosa immediately, and within about half an hour it will have appeared in the urine. By whatever route it is given, it will not reach the systemic blood faster than this. There are, however, some cases in which there is no response to oral administration and the reasons for this are as follows :—

(1) Absence, or a shortage, of quinine in the so-called quinine mixture. This may be due to the dishonesty or carelessness of the dispenser or of the manufacturer; many instances have been reported in which serious consequences have resulted.

(2) Faulty preparation of the tablets, that is, they may be insoluble through the presence of too much amorphous alkaloids, or coated with some insoluble substance.

(3) Vomiting of the mixture, or tablet.

(4) Failure of absorption by the gastric mucosa.

(5) Deception by the patient himself, or herself, on account of prejudice (pregnant woman) or malingering.

The methods that can be recommended to circumvent some of these occurrences are to test the stock mixtures by means of the simple technique suggested by Sir John Megaw, and to test the urine of the patient by the Tanret-Mayer test for the presence of quinine.

Test for quinine in mixture

The reagent is made up as follows :—Pure phosphotungstic acid—1 ounce, dilute sulphuric acid—5 ounces and rectified spirit—12 ounces. Place 2.5 c.cm. of the reagent into each of two narrow tubes; add to one 0.25 c.cm. of the quinine solution to be tested and to the other 0.25 c.cm. of a control quinine containing the amount of quinine the mixture was supposed to contain, *e.g.*, 10 grains to the ounce. A precipitate forms which will settle and the two tubes can be compared in half-an-hour's time. Any gross deficiency will be obvious.

Tanret-Mayer test for quinine in urine

The reagent is made as follows :—Add a solution of 1.45 grammes of mercuric chloride in 80 c.cm. of undistilled water to a solution of 5 grammes of potassium iodide in 20 c.cm. of distilled water, agitating the solution all the time. To test the urine, first boil and then filter it, then add a few drops of reagent to 5 c.cm. of the urine: an immediate precipitate forms if the alkaloid, quinine, is being excreted in the urine.

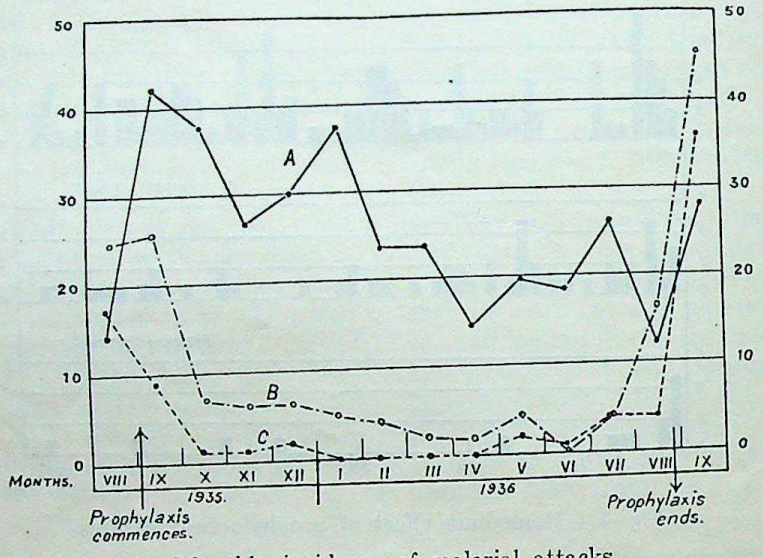

Fig. 2.—Monthly incidence of malarial attacks.

		Number of subjects.
A =	Controls	91 ± 14
B =	Quinine 0.4 gramme daily.	91 ± 17
C =	Atebrin 0.4 gramme weekly.	103 ± 12

Parenteral therapy

It is not proposed to discuss here the vexed question of intramuscular *versus* intravenous therapy and for the moment they will be referred to together as *par-enteral* (παρα=besides: ευτερου= intestine) therapy.

The points for and against this method of administration may be considered under the following headings :—

Necessity.—In certain circumstances parenteral therapy is essential, as for example in unconscious cerebral cases and in cases where there is persistent vomiting.

Advantages.—The main advantages are that one gives the injection oneself, and is therefore certain that it has been taken, and further that it has been absorbed.

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Dangers.—These are not very great if sufficient care is taken. Scrupulous asepsis is required in the case of intramuscular injection, or abscess and even tetanus may follow. Secondly, great care must be taken to avoid large nerves, or neuritis or paralyses may be caused. Many instances of severe and permanent damage following careless administration have been recorded and illustrated in the literature.

In the case of intravenous therapy the injections must be given slowly and the drug well diluted, or syncope and collapse may occur.

Preparations and dosage. Intravenous.—Ten grains of quinine hydrobromide in 20 c.cm. of normal saline; repeated again later in the day;

or

atebrin musonate 0.125 g. (=0.1 g. atebrin hydrochloride) in 3 c.cm. of distilled water, given three times in the day.

Intramuscular.—Ten grains of quinine hydrobromide or bihydrochloride in 4 c.cm. of saline, given into the gluteus maximus, the vastus externus, the muscles at the angle of the scapula, or the deltoid;

or

atebrin musonate 0.375 g. (=0.3 of atebrin hydrochloride) in 9 c.cm. of distilled water, into one of these muscles.

However, even when parenteral therapy is indicated, *it is seldom necessary to continue it beyond the first day : after this oral therapy can usually be instituted.*

Before passing on to the next heading, mention must be made of a recommendation of the Health Committee of the League of Nations, which has been severely criticized, but with which the writer is in part agreement. They recommend that in the *initial* attack of malaria the patient should be allowed to remain untreated for a few paroxysms in order that he may work up his natural immunity before he is given any anti-malarial drug.

This suggestion is based on reliable experimental evidence and it is no doubt absolutely sound advice, in theory, but in practice it is seldom possible to do this, as in most cases the patient's only desire is to be cured of the immediate attack, and if one insisted he would simply call in another doctor. It is, in any case, only advocated in benign tertian infections.

(*iv*) *Treatment to prevent relapses.*—The big-stick methods which were at one time popular, large daily doses of quinine over long periods, have quite gone out of fashion. The average case of malignant tertian infection will not relapse after the ordinary curative dose of cinchona, quinine or atebrin, but as relapse may be serious a second course after an interval of 7 to 10 days is usually advisable; the same remark applies to quartan infections. In the case of benign tertian infections the relapse rate after quinine alone is usually high (70 per cent) and some special measures should certainly be adopted.

Following the line of thought started by Acton who showed that quinine acted best in an alkaline substratum, Sinton advocated the following routine procedure in the treatment of relapsing benign tertian malaria.

The two mixtures he used were—

Mixture A

℞

Sodii bicarbonatis	.. ..	gr. lx
Sodii citratis	.. ..	gr. xl
Aquam ad	.. ..	℥i

Mixture B

℞

Quininæ sulphatis	.. ..	gr. x
Acidi citratis	.. ..	gr. xx
(or acidi sulph. dil	.. ..	m. xxx)
Aquam ad	.. ..	℥i

Course

Give calomel in divided doses, *i.e.*, 6 quarter-grain doses at half-hour intervals at night, and magnesium sulphate at 6 o'clock in the morning, ℥ss to ℥i: at 7-30, 9-30 and 11-30 give one dose of mixture A followed by a dose of mixture B at 12 o'clock; at 6 o'clock give a dose of mixture A, followed half an hour later by a dose of mixture B.

From the 2nd to 5th days inclusive give three times during the day a dose of mixture A, followed half an hour later by a dose of mixture B.

On the 6th and 7th days give a dose of mixture A, followed half an hour later by one of mixture B, twice during the day.

This makes a total dose of 180 grammes of quinine. Totaquina may be substituted for quinine without detriment to the treatment and where economy is to be considered this should always be done.

Quinine plus *plasmochin*

A very marked further reduction in the relapse rate in benign tertian malaria can be obtained by the addition of plasmochin to the quinine. The following dosages are recommended; the results obtained with each of these courses are about the same, but in either case the patients should be kept under observation for signs of intolerance to plasmochin.

Plasmochin 0.02 gramme × 2 + 20 grains of quinine, or

Plasmochin 0.01 gramme × 3 + 30 grains of quinine

—daily for seven days.

Atebrin and atebrin plus *plasmochin*

Better results have been obtained with atebrin alone than with quinine alone, but, even with atebrin, plasmochin can be added with advantage in benign tertian infections.

Atebrin 0.1 g. thrice daily + plasmochin 0.02 g. once a day for 5 days—given together or separately,

Atebrin 0.1 g. + plasmochin 0.0033, combined in one tablet, thrice daily for 5 days.

Many workers believe that the toxic symptoms produced by atebrin are more likely to

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occur when plasmochin is given with it; though this point has not been finally settled it is again best to keep the patients under observation when the combined dosage is given.

(*v*) *Gametocyte destruction in the cause of general prophylaxis.*—This does not in any way help the patient, as gametocytes can never again become asexual forms as long as they remain in the blood, but if they are taken up by a mosquito they develop and the infection may be transmitted to others. It is therefore only in the interests of *general* prophylaxis that attempts should be made to destroy gametocytes.

It is in this capacity that plasmochin is unique. No other drug that we know will destroy the gametocytes of malignant tertian, but this can be effected by a very small dose of plasmochin, 0.01 gramme, twice a day for three days, given for the last three days with the quinine or atebrin, or after the course has been finished.

Mass treatment with plasmochin is a suitable prophylactic measure for isolated communities, but it is essential that every single member of the community, not excluding infants, should be treated.

A comprehensive course

Now we have considered treatment of malaria under the five headings separately, but in most circumstances you will wish to achieve more than one of these aims; in fact, except for the first aim which I have said cannot be achieved with any drug we have at our disposal, you will often wish to achieve all of them. That is to say, you will want to treat the clinical attack, you will want to ensure that the condition does not relapse, that the patient does not get reinfected, and finally that he is not a source of infection to others. For this, I can recommend a routine course as follows :—

Atebrin 0.1 gramme (or 1½ grains) three times a day with plasmochin 0.02 gramme (or ⅓ grain) once a day, for five days, followed by 0.2 g. atebrin in a single dose on two consecutive days each week.

Or, if the cinchona alkaloids are preferred to atebrin, totaquina gr. 10 three times a day and plasmochin 0.02 gramme once a day, for seven days, followed by totaquina gr. 6 daily, as long as prophylaxis is to be maintained.

Toxic effects

Although toxic effects do occasionally follow atebrin administration, there is a considerable amount of misapprehension on the subject and I feel that a few words on the toxicity of atebrin will be appropriate here.

Almost without exception all drugs that are active are toxic. Toxicity must therefore be considered relatively—the dose administered and the person to whom it is administered. There is strong evidence that atebrin given in the ordinary therapeutic doses is not toxic to the ordinary individual—occasionally a patient who has some idiosyncrasy to the drug will show special symptoms.

The incidence of toxic symptoms.—This personal idiosyncrasy is our experience with all drugs, but the practitioner naturally wants to know how often these susceptible individuals are likely to crop up in his practice.

I can quote a few figures from recent experience in India and Malaya.

Williams and Bhattacharyya (1935) reporting mass treatment in Assam gave the following figures :—

234 tea-garden coolies (1 gramme of atebrin in five days)—8 cases of mild ill-effects, including 3 of yellow discoloration, 3 of giddiness, 1 of slight abdominal pains and 1 of anorexia.

Newman and Chalam (1935) reported as follows :—

258 railway employees (atebrin 1.5 g., plasmochin 0.15 g. given separately over a period of 5 days)—slight yellow discoloration in 5, gastric symptoms in 7, and more severe gastric pains in 3.

They had a higher incidence of ill-effects when the drugs were given together.

In a group of coolies in Malaya, Green (1934) reported the following results :—

613 working coolies (1.5 g. atebrin in 5 days)—no symptoms reported.

117 hospital cases (2.1 g. atebrin in 7 days)—10 per cent had slight symptoms.

20 special hospital cases (2.8 g. atebrin in 7 days)—35 per cent had symptoms, some severe.

Wallace (1936) reported the mass treatment of 3,000 Malayan coolies (1.5 g. atebrin in 5 days) with 3 per cent mild and transient symptoms and no psychoses.

He also referred to three groups of mass-treated cases (atebrin 1.5 g. + plasmochin 0.14 g. in 7 days) in which there were 1 per cent, 1 per cent, and 2.3 per cent mild symptoms, respectively, in the different groups.

It will be seen that with an increase in dosage there is an increase in the incidence of by-effects. Nevertheless, if the practitioner keeps to the ordinary dosage, which is an efficient dosage, he will seldom in his whole experience meet with anything but the mildest by-effects and these should not deter him from using a valuable drug.

The actual and reputed by-effects can be classified as follows :—

(*i*) *Due to a misconception—e.g.,* yellow colour mistaken for jaundice.

(*ii*) *Symptoms really due to malaria itself—e.g.,* gastro-intestinal or cerebral disturbances, hæmoglobinuria.

(*iii*) *Symptoms following overdosage,* as noted below (*iv*) and (*v*) in—

(*a*) patients who have undertaken treatment themselves,

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(*b*) patients who have been first treated by a doctor and then continued treatment themselves, and

(*c*) patients whose doctors have wrongly advised them through ignorance.

(*iv*) *Mild by-effects which cannot harm the patient but about which the doctor should warn him—e.g.,* (*a*) yellow discoloration—suggesting that the drug is not being properly excreted; this should also act as a warning signal, and

(*b*) a 'knocked-out' feeling (general lassitude) due to reduction in hæmoglobin which is dependent on destruction of parasitized red cells (it does not occur in the uninfected person receiving atebrin).

(*v*) *Personal idiosyncrasy following ordinary dosage—e.g.,* gastric pains, headaches, giddiness, anorexia, hæmoglobinuria, epileptiform fits, and psychoses.

Hæmoglobinuria is more usually associated with plasmochin administration.

Epileptiform fits have been reported—the consequence was not serious and the evidence that they were actually caused by the drug was not complete. A few cases of temporary psychosis have been reported from Malaya where an enormous number of people have been treated by the drug.

(*vi*) It is known that plasmochin in large doses will give rise to symptoms (*e.g.,* cyanosis, syncope, hæmoglobinuria, gastric pains); it is suggested that the addition of plasmochin will increase the toxicity of atebrin. This is still doubtful but some workers advocate the separate administration of these two drugs.

I will conclude by repeating that the average practitioner will seldom encounter any serious ill-effects after atebrin administration if he follows the orthodox dosage. At the School of Tropical Medicine, though we have had patients who have come into hospital for treatment on account of suggestive symptoms following the administration of both atebrin and plasmochin, we have treated many hundreds of patients with atebrin during the last six years and in none of these have any serious symptoms followed.

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Medical News

KING GEORGE THANKSGIVING (ANTI-TUBERCULOSIS) FUND.

SUMMARY OF TUBERCULOSIS NEWS FOR JANUARY 1938.

Post-graduate course in tuberculosis.—The sixth post-graduate course, organized under the auspices of the Fund, took place at the All-India Institute of Hygiene, under the chairmanship of Col. P. S. Mills, Surgeon-General with the Government of Bengal and Chairman of the Bengal Provincial Anti-Tuberculosis Sub-Committee. Thirty doctors from all over India attended this course.

Dr. Sikand, Organizing Secretary of the Fund, in welcoming the candidates, said that one of the important items in the medical control of tuberculosis is the training of physicians, and, as such, formed one of the activities of the Fund. The object of the course was to train workers who will return to their areas in a real missionary spirit and help to organize anti-tuberculosis measures.

Col. Mills in his presidential address referred to tuberculosis as a symptom of a very much wider disease, *i.e.,* the economic disease. It was a symptom among many others of world conditions resulting in a state of affairs by which human beings were living in bad physical surroundings. Enormous numbers of people were badly housed, had insufficient food and a quality of food that was not suited to equip them in the great fight against parasites, which were lying in wait to attack mankind on this earth, where life is characterized by universal parasitism. In the appeal under the King-Emperor's Anti-Tuberculosis Fund a great effort has recently been launched. It was devoutly to be hoped that those who had come to attend the course would, in their turn, do all in their power in the future to help that effort.

Sir Upendra Nath Brahmachari in his opening address, after quoting figures to show that, while tuberculosis was declining in other countries, it was increasing in India, pointed out the danger of spread to the villages as a result of urbanization and industrialization. He stressed on many points that were essential in the campaign against tuberculosis.

Anti-Tuberculosis Work in Bombay Presidency.—Though the city of Bombay had quite a comprehensive anti-tuberculosis scheme for several years past, yet the work outside Bombay had not made much headway till a new orientation was given to it by a committee which was reorganized in 1936 as a sub-committee of the Bombay Red Cross Society under the chairmanship of the surgeon-general.

The committee concentrated its attention on the work of tuberculosis clinics, six of which, attached to the civil hospitals at Ahmedabad, Surat, Poona, Sholapur, Nasik and Belgaum, were opened in April 1937. Each clinic is under the charge of a qualified medical officer, assisted by a duly registered nurse, both of whom have had a month's training in tuberculosis institutions.

Out of 2,141 new cases examined, 597 new cases of tuberculosis were discovered. The health visitors paid 6,400 domiciliary visits and arranged for the examination of 2,054 contacts.

The annual cost estimated on six clinics is about Rs. 14,680, of which half the expenditure of Rs. 8,280 on nurses is borne by the Bombay Provincial Branch of the Red Cross Society, and the other half by the Bombay Government. The annual grant of Rs. 3,000 paid by the King George Thanksgiving Fund is received by the Society.

Proposals have been submitted to the Bombay Government for affording facilities for three microscopic examinations of sputa at government hospitals and laboratories.

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The civil surgeons have been requested to arrange short instructive courses of lectures and clinical demonstrations in consultation with the medical officers in charge of clinics and local medical associations, where they exist.

TENTH INTERNATIONAL CONGRESS OF DERMATOLOGY AND SYPHILOLOGY.

THE Tenth International Congress of Dermatology and Syphilology will be held in New York City, U. S. A., in September 1940. Dr. Oliver S. Ormsby is President and Dr. Paul A. O'Leary, Mayo Clinic, Rochester, Minnesota, U. S. A., is the Executive Secretary.

REPORT OF THE FIRST BOMBAY PROVINCIAL CONFERENCE OF THE ALL-INDIA MEDICAL LICENTIATES' ASSOCIATION.

THE opening session of the conference commenced at 2-30 p.m. (S. T.) on Saturday, the 18th December 1937, in the Dhanraj Hall (main lecture hall) of the National Medical College, Bombay. Amongst the distinguished guests were : Major-General H. C. Buckley, Surgeon-General with the Government of Bombay, Major Chopra, P. A. to the S. G. with the Government of Bombay, Lieut.-Colonel Vazifdar, President, College of Physicians and Surgeons of Bombay, Dr. D. H. Dudha, Principal, National Medical College, Bombay, Dr. H. V. Tilak, C. M. O., Nair Hospital, Bombay, Dr. V. G. Rele, Ex-Principal of the National Medical College, Bombay, Rao Bahadur Dr. R. V. Mone, Civil Surgeon, Thana, Dr. A. V. Baligra, Hony. Surgeon, K. E. M. Hospital, Bombay, and others.

Major-General Buckley in his inaugural speech said that the conference would consider many important questions. He asked the conference to give deep consideration to the problem of medical relief in rural areas. Another problem the conference would have to consider was that of medical education. In another province he had preached in and out of season that the day of the medical school was past. There should, he said, be one standard of education, the four-year course should be raised to a five-year course, and the education should be of the university standard. He further observed that the Medical Council should be the most important body in dealing with the affairs of the profession in the province and asked the conference to think very clearly in defining its attitude to the Council, for the prestige of that body should be maintained and no attempt should be made to turn it into a mere debating society.

Dr. U. Shesha Rao, the Provincial Secretary, then read his report for the year. In his report he pointed out the various advantages that would accrue if the licentiates were all to join under the banner of the All-India Medical Licentiates' Association and concluded it by exhorting the Licentiates, one and all, to immediately join the Association if they have not already done so and thus strengthen the hands of the Association in getting all their legitimate grievances redressed.

Presidential Address : Dr. Joseph Benjamin in his presidential address pointed out that the interests of the Licentiates were not safeguarded in the Bombay Medical Council as they should be owing to the poor representation given to the Licentiates therein. He said that a deputation should wait on the Hon'ble the Minister of Health to request him to amend the Bombay Medical Act on a democratic basis and hoped that the Hon'ble Dr. Gilder would take up the cause of the Licentiates in the Bombay Legislative Assembly and introduce a bill for the purpose. Dr. Benjamin appealed to the members of the Indian Medical Council as well as the members of the Central Assembly to move an amendment to the Indian Medical Act so as to include the Indian Medical Licentiates in it.

The President said that it was high time that Licentiates are taken on the Board of Management of the College of Physicians and Surgeons, Bombay, so that they could watch the interests of their class. Licentiates earnestly desired that the door to appear for competitive examinations for all the medical services in India should be opened to them also.

The remaining days of the conference were devoted to the reading and discussion of papers, and visits to various commercial undertakings concerned with the manufacture of drugs and other medical supplies.

Resolutions.—This conference is of opinion that the L.C.P.S. Course should be abolished from 1938 and requests the Government of Bombay and the Bombay Medical Council to take the necessary steps in the matter.

Resolved that this conference requests the Bombay Government to amend the Bombay Medical Act VI of 1912 as follows :—An elected president; an elected vice-president; six seats for the graduates and six seats for the Licentiates and others in the register and three to be nominated by the Government.

Resolved that the Medical Licentiates be given equal representation on the Board of the College of Physicians and Surgeons so long as it exists.

Resolved that the Bombay University be requested to kindly permit the L.C.P.S.'s (Bom.) to appear for the M.B., B.S. Examination after attending the course for two years at a medical college without insisting for preliminary educational standard.

Resolved that the Bombay Medical Council be urged to throw open the meetings of its Executive Committee to the registered medical practitioners and the medical and lay press representatives, except during the deliberations of penal cases.

Resolved that the Bombay Medical Council be requested to effect the necessary changes in the present code of medical ethics only after duly consulting the medical men on their register, medical associations and the medical press.

Resolved that the Surgeon-General with the Government of Bombay be requested to give effect to the Government of India resolution No. 9211, dated 14th November, 1914, about the promotion of deserving and experienced men in the S. M. S. to the B. M. S. Cadre.

This conference views with deep concern the appointment of graduates in the cadre of S. M. S. Officers, which has been an encroachment upon the rights of these deserving men who enjoyed the privilege till now, and requests the Government to stop further enlistment of graduates into the S. M. S. Cadre.

Resolved unanimously that the Bombay Government be requested to give honorary appointments to Licentiates of approved merit and experience in civil hospitals.

Resolved that the Government of India be requested to amend as early as possible the Indian Medical Council Act of 1933, so as to include Indian Medical Licentiates within its scope and requests the present members of the Indian Medical Council as well as members of the Central Legislative Assembly to take immediate steps to remove the injustice which has been done to the Indian Medical Licentiates by their exclusion from the scope of the Act.

Resolved unanimously that the Bombay Government be requested to grant study leave to the desiring members of the Sub-Medical Service class under the same conditions as granted to men in the higher medical services.

In view of the onerous and hard duties which the Medical Licentiates have to perform in various capacities, the Bombay Government be requested to continue the same scale of pay as it is existing at present.

This conference notes with deep concern the recent Government resolution No. 1714/33, dated 16th November, 1937, excluding Bombay Medical Service, Class II Officers, who are not graduates from the membership of Medical Boards constituted for the purpose of commutation of pension and therefore requests the Government to remove this humiliating restriction in the case of the non-graduates, Bombay Medical Service, Class II Officers, and to allow them all the rights and privileges of that service.

This conference recommends to the Board of College of Physicians and Surgeons of Bombay to appoint as examiners only those who have been in the teaching line.

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Resolved that the Government and the local authorities be requested to allow the use of the courtesy title of 'Dr.' in the official correspondence to all registered Medical Practitioners under them.

This conference is of opinion that none but registered Medical Practitioners should prescribe poisonous drugs of the British Pharmacopœia or its preparations and that it should be made illegal for any chemist to dispense a prescription containing such drugs or prescriptions unless signed by a registered Medical Practitioner.

Resolved that the Dangerous Drugs Act 2 of April 1936 be repealed so as not to affect the registered Medical Practitioners.

This conference requests the Bombay Government to enact legislation to prevent the practice of Western (allopathic) system of medicine by those who do not possess registrable qualifications and also to make it illegal to use the title of 'Doctor' by any one who does not possess registrable medical qualification.

Resolved unanimously that the Surgeon-General with the Government of Bombay be requested that the present orders debarring failed students in the final L. C. P. S. Examination to re-appear in the examination after five failures be withdrawn as early as possible in view of the hardships undergone by the medical students and having no other line open to them after passing two examinations and studying the medical schools for a period of four and a half years or more.

Resolved unanimously that the Bombay Government be urged that medical certificates granted by registered Medical Practitioners be accepted by the officers concerned without the same being countersigned by the Civil Surgeons or the Administrative Medical Officers.

INDIAN MEDICAL COUNCIL.

Under section 3(1)(*a*) of the Indian Medical Council Act, 1933, the Governor is pleased to nominate Colonel P. S. Mills, C.I.E., I.M.S., Surgeon-General with the Government of Bengal, to be a member of the Medical Council of India in the place of Major-General D. P. Goil, I.M.S., resigned.

Colonel G. G. Jolly, I.M.S., nominated as a Member of the Medical Council of India, from the Punjab *vice* Colonel C. H. Reinhold, I.M.S., resigned.

Current Topics

Study of the Therapeutics and Prophylaxis of Malaria by Synthetic Drugs as Compared with Quinine

(Extract from the Fourth General Report of the Malaria Commission of the Health Organization of the League of Nations, 1938)

1. ACTION OF QUININE AND OF SYNTHETIC PRODUCTS ON THE DIFFERENT MANIFESTATIONS OF MALARIAL INFECTION

(*a*) *Quinine*

(1) Action on the *trophozoites in primary infections.* A minimum daily dose of 0.50 grm. of quinine hydrochloride sometimes suffices to cause a temporary disappearance of the trophozoites of *P. vivax;* but a *mean daily dosage* of 1 grm. for five to seven days is often necessary to cause the trophozoites to disappear (on an average on the third day) and not to make their reappearance in the peripheral blood until after a latent period of varying length, in the course of the first relapse. In quartan (*P. malariæ*) the same effects are usually obtained. In infections with *P. falciparum,* the average effective daily dose should be fixed at about 1.30 grm. to produce analogous results. In some countries, it is even necessary to use 2 grm. in order to obtain a rapid effect upon the clinical attack and on the parasites. With the usual dose of 1 grm. the trophozoites generally disappear *one day later,* on the average, than in the case of *P. vivax;* sometimes their resistance continues even longer.

(2) Action on the *gametocytes* of *P. vivax* and *P. malariæ.* Quinine, in the doses indicated, exercises its parasiticidal activities on the young forms of *P. vivax* and *P. malariæ* capable of producing gametocytes, and also on fully-developed gametocytes. On the fully-developed gametocytes of *P. falciparum,* quinine has only a very slight action; but it also impedes the formation of the pre-gametocytes of this species. It may thus be regarded as directly schizonticidal and indirectly gametocidal in the case of *P. falciparum.*

(3) *On the acute clinical symptoms of primary infection,* quinine, in the indicated doses, has a definite action from the third day onwards (second paroxysms of fever) in benign tertian; its action is less reliable or less rapid, according to the strain of *P. falciparum* concerned, on attacks of malignant tertian, which often continue until the fifth dose (third or fourth paroxysm).

(4) *On the frequency of relapses in general,* quinine has a clearly marked effect which is, however, influenced by individual factors and by the strain of parasite. The treatment of primary *P. vivax* or *P. malariæ* infections with quinine in the usual doses (1 grm. daily) is followed by relapses in a proportion of individuals which may be as high as 50 per cent.

(5) *The action of quinine on splenomegaly,* when suitable treatment is applied in each attack, has proved to be of real efficacy in endemic regions, especially among children. It is but transient, however, if the community concerned is subject to a high proportion of relapses or is exposed to frequent reinfections.

(6) Quinine treatment with the usual doses does not affect the patient's general condition adversely and generally has no depressive or toxic effect, if the period of administration is limited to the strictly necessary number of days. In such a case, there is no good reason for thinking that this treatment hinders the processes of immunization, but ill effects may occur when treatment is unnecessarily protracted.

(*b*) *Atebrin*

(1) Action on the *trophozoites.* Atebrin in daily doses of 0.30 grm. (for adults) has a slightly more rapid action on *P. vivax* trophozoites than quinine in the usual dose of 1 grm. The trophozoites disappear on an average after the third dose, and in some cases even after the second. This parasiticidal action appears to continue for a longer period, in that the phase of latency of the disease (absence of clinical symptoms) is established more certainly and lasts somewhat longer after the end of treatment with atebrin than with quinine. On the trophozoites of *P. malariæ,* the action of atebrin can be said to be of the same nature. On the trophozoites of *P. falciparum,* atebrin is equally in advance of quinine in certain cases; but the differences between the strains of parasite prevent the drawing of uniform conclusions. The trophozoites of *P. falciparum* disappear from the peripheral blood after the fourth dose of atebrin in 90 per cent of cases.

(2) *The action of atebrin on the gametocytes* is of a similar nature to that of quinine; it has no effect, from the point of view of devitalization, on the gametocytes of *P. falciparum.* But the action on gametocytes already present in the blood is perhaps slightly more marked than that of quinine, particularly as regards the gametocytes of *P. vivax* and *P. malariæ.*

(3) *The action on the clinical symptoms of an acute attack is very marked, both in benign tertian and in malignant tertian.* In some endemic regions, where there may possibly be special strains of *P. falciparum,* the therapeutic action of atebrin is even more energetic on malignant tertian than on benign tertian.

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But, in other cases, the contrary seems to be true. This is why some practitioners and malariologists in tropical countries prefer to use quinine during the first days of the acute attack and to continue with atebrin thereafter. In benign tertian the fever nearly always falls after the first three therapeutic doses of atebrin—that is to say by the second attack. In malignant tertian the fever falls almost invariably by the third attack.

(4) *The action of atebrin on relapses is slightly more* effective than that of quinine, especially in the case of benign tertian and of certain strains of malignant tertian.

(5) *The spleen rate* in communities treated with atebrin seems to decrease somewhat more slowly than in communities treated with quinine, but the effects of the drug continue to be felt for a longer time during the observation period after the end of the treatment, the decrease in the percentage of enlarged spleens continues longer, and the return of the splenic index figures to their former high level occurs a little later.

(6) *The action of atebrin on the general condition of patients* seems to be determined by factors which, after this form of treatment, are still not entirely known—that is to say, by the action of the drug on the organic defences in general and on the processes of immunization. The yellow coloration of the skin produced by atebrin is a disadvantage, especially during prolonged prophylactic treatments.

(c) *Plasmoquine*

(1) *Action on the trophozoites.*—The action of plasmoquine on the trophozoites of *P. falciparum* is almost nil. It acts to some extent on the trophozoites of *P. vivax,* and especially on those of *P. malariæ.* With small non-toxic doses of plasmoquine associated with the usual doses of quinine or atebrin, better results are sometimes obtained on the trophozoites of *P. vivax* and even of *P. falciparum.*

(2) *Plasmoquine acts upon the gametocytes of the three species, but especially on those of* P. falciparum, which are practically unaffected either by quinine or by atebrin. In minimum doses of 0.12 grm., plasmoquine devitalizes the gametocytes of *P. falciparum* and at the same time diminishes their numbers.

(3) There is no advantage in using plasmoquine alone for the *treatment of the clinical symptoms* of an acute attack in any of the forms of malarial infection.

(4) *Plasmoquine has a definite effect upon the frequency of relapses* of benign tertian or quartan. In association with quinine or atebrin, or administered after either of these two drugs, it is to a marked degree effective in preventing relapses in benign tertian (except perhaps in the case of a few particular strains) and quartan, and appears similarly to reduce the frequency of malignant tertian relapses.

(5) We do not possess sufficient data to assess the action of plasmoquine alone, used either therapeutically or prophylactically, *upon the state of the spleens in malarial communities,* for it is nearly always administered together with other drugs.

(6) The small doses of *plasmoquine* (0.02 grm. for example) that are now being used seem to have no serious depressing effect on the general state of the patient. That the prolonged use of plasmoquine may exert some influence on the neoformation of hæmoglobin must not be overlooked.

(d) *Quinine-atebrin, quinine-plasmoquine and atebrin-plasmoquine combinations*

(1) The few experimental observations that have been published give no indication that there is any advantage in combining quinine and atebrin together for purposes of treatment.* Further clinical research is required in order to determine the effects of these two drugs, when administered one after the other (usually quinine first and atebrin afterwards), in the treatment of acute attacks of certain kinds of infection, especially *P. falciparum.*

(2) The combined use of quinine with plasmoquine produces less frequent and less intense toxic symptoms than that of atebrin with plasmoquine. The association properly so called (that is to say, the *simultaneous* use) of quinine and plasmoquine (for example, up to 0.02 grm. or even 0.03 grm. of plasmoquine daily for short treatments) therefore does not involve any particular contra-indications. Certain authors recommend however that, whenever possible, the two drugs be administered consecutively. For the treatment of *adult groups* under observation (soldiers, workers) there is, however, no serious disadvantage to be feared from the simultaneous use of quinine and plasmoquine, which moreover shortens the duration of treatment.

The association of quinine with plasmoquine represents one of the most efficacious methods of treating *benign tertian* and *quartan* malaria. Treatment with average doses (1 grm. to 1.30 grm.) of quinine *plus* plasmoquine (even only 0.02 grm. to 0.03 grm. twice a week) greatly reduces (perhaps more than any other method) the number of relapses in benign tertian (except, as already indicated, in the case of certain strains) and in some cases also in *malignant tertian.*

(3) *The simultaneous administration of atebrin and plasmoquine* appears to aggravate the toxicity of each. It is not to be advised, though it is understood to have been used without ill effects in certain communities of adult men. It should in any case not be adopted without medical supervision. Consecutive treatment with atebrin first and then with plasmoquine in suitable doses (0.30 grm. atebrin daily for five or seven days followed by 0.02 grm. plasmoquine daily for five days) has no appreciable influence either in reducing the proportion of trophozoites in the blood or on the clinical manifestations. Like the quinine *plus* plasmoquine treatment, that method has, however, the advantage of decreasing and devitalizing the gametocytes, especially those of *P. falciparum.* Moreover, from the clinical point of view, it diminishes substantially the number of relapses, both in *malignant tertian* and, more especially, in *benign tertian* and *quartan.*

2. PRACTICAL SUGGESTIONS FOR TREATMENT AND PROPHYLAXIS

Without presuming to lay down hard and fast rules, and while avoiding any interference with either the personal freedom of the doctor, who has to take the responsibility for the treatment of each case, or the initiative of the malariologists, who have to judge the different circumstances of the local epidemiology in the field, the commission believes that it is in a position to give certain indications. Account should however first be taken of the following points, on which reservations have been made in the previous pages, with respect not only to the individual treatment of patients, but generally also to the application of any therapeutic procedure: (1) The varying reactions of the different parasite strains of the same species and of patients to the drugs; (2) the special indications applicable to the parenteral administration of drugs; (3) the drawbacks of the synthetic products (yellow coloration of the skin by atebrin, toxicity of plasmoquine).

(a) *Individual treatment of patients*

It is always desirable that the doctor should be in a position to diagnose malaria and to determine the species of parasite concerned, by *microscopic examination of the blood.*

In ordinary cases of *P. vivax* (benign tertian) infections, it is almost immaterial whether quinine or atebrin is employed for treatment of the attack. Plasmoquine, associated with quinine or atebrin, or administered after these drugs, has no appreciably useful effect on the attacks but seems to reduce the frequency of subsequent relapses.

The association of plasmoquine with quinine, or its administration after atebrin, is useful in *P. falciparum* infections, on account of its action on gametocytes and relapses.

* Prof. Rodhain, in a private communication, states that he has recently obtained beneficial effects by this method.

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(b) Treatment in the field

Atebrin, when used for collective treatment in daily doses of 0.30 grm. (for adults) for five to seven days, acts in the same way as quinine in daily doses of 1 grm. to 1.30 grm. for five to seven days or more. There is no reason save financial considerations, why either quinine or atebrin should be preferred. The manner in which collective treatment is conducted will depend upon the intensity of the endemicity, which is itself the resultant of a series of factors; the incidence of malignant tertian infection (*P. falciparum*), the virulence of the strains, the sensitiveness of the strains to the various drugs, the susceptibility of various population groups, etc.

Collective treatment with quinine or atebrin may usefully be accompanied or followed by plasmoquine treatment, in order to diminish the number of gametocytes and the risk of relapses.

The choice of the *basic drug* for collective treatment should be left to the public administrations or malariological organizations which undertake or control such treatment, and will be guided by local and economic considerations as well as by the preferences of the medical profession and of the population. It should, however, be remembered that the choice of drug, as well as dosage and duration of therapeutic administration, should, so far as possible, be directed towards the achievement of the real aim of mass treatment. This aim is: (1) to secure the largest number of complete cures in case of malaria (*intensive treatment of patients*); (2) to reduce to a minimum the risk of anopheline infection, either by direct action upon the gametocytes, or by indirect action on the parasites generally, thereby effecting an eventual reduction in the number of carriers of sexual forms (*gametocyte therapy*). It would therefore be wise not to rely on plasmoquine alone for this second purpose. These considerations also apply to the choice of the basic drug and the manner of its administration to the community, either directly associated with or followed by plasmoquine.

There are, however, large malarial areas, especially in the tropics, where such mass treatment is impossible of practical application for various reasons, often financial. Under such conditions, it is desirable to provide *adequate and easily available treatment for the clinical manifestations* of the disease, so that the morbidity, the mortality and the physical incapacitation of the afflicted individuals are diminished. Such treatment has very often to be placed in the hands of laymen for distribution, and little or no direct medical supervision is possible. In these circumstances, the cinchona alkaloids appear to be the more suitable drugs.

(c) Mass drug prophylaxis

Mass drug prophylaxis has a twofold purpose: (1) to protect the population undergoing prophylactic treatment from the clinical manifestations of endemic malaria, in order that its working capacity and comparative standard of health may be safeguarded without injury to its premunization, even in areas in which it is exposed to repeated reinfection; (2) to reduce, in due course, the sources from which the local mosquitoes may be infected.

No prophylactic method, unless applied to disciplined communities under stringent supervision, is capable as yet of attaining these two objects. Special stress should be laid upon the desirability and, at the same time, the difficulty of promoting the immunization process in the population, which depends precisely upon the degree of tolerance to infection and upon repeated reinfection. At the same time one wishes to avoid the risks attendant upon the presence and persistence of such latent infections in the community.

Experience has shown, at all events, that very useful results can be obtained with *daily doses of quinine* (0.04 grm.) administered during the whole of the malaria transmission season, and even for a few weeks longer. This is also true of *bi-weekly doses of atebrin* (0.20 grm. = 0.40 grm. per week) administered in certain conditions. With the latter method (bi-weekly atebrin), which has given encouraging results, further trials would be desirable. The daily dose of 0.05 grm. of atebrin recommended for prophylactic purposes has proved inadequate. The harmlessness of quinine makes it a suitable drug for administration by subordinate personnel without constant medical supervision, whereas such supervision is essential in the case of atebrin.

Plasmoquine should not be distributed for prophylactic treatment otherwise than under direct medical control. Its use in mass prophylaxis would be justifiable only if it were administered to a disciplined population, which should be kept under constant medical care. It is useful more especially for the purpose of ultimately reducing the number of gametocyte carriers and arresting the transmission of infection to the anopheles. Plasmoquine is certainly the gametocidal agent *par excellence*, especially where *P. falciparum* is concerned. But both quinine and atebrin also exercise in the latter case a gametocidal action (mainly indirect) by destroying the sexual forms in process of development.

The real efficiency of such methods in the field is, moreover, largely dependent upon a highly important epidemiological factor: namely *the children*. The proportion of gametocyte carriers is much higher among children than among adults, given the same environmental conditions (village, house, family) in respect of endemicity and anophelism. Children, on the other hand, are more difficult to subject to regular treatment, and finally, as already pointed out, the *doses* and *form of administration* of atebrin and plasmoquine to children cannot yet be regarded as finally settled.

(d) Drug eradication

Experience has so far shown that the eradication of malaria from a locality by the curative and prophylactic treatment, with the drugs at present available, is practically impossible. To begin with, it is impossible to reach, in sufficient time, all the inhabitants of an area, or even of a small village. Moreover, while curative and prophylactic treatment *may greatly diminish the morbidity yet it cannot suppress the parasites in all the carriers.*

* * * * *

In this report, the commission has not considered the question of expenditure entailed by treatment and prophylaxis campaigns, which depends upon the price of drugs and the cost of staff. It would, however, emphasize the great importance of this problem—which will probably be studied in detail by the Malaria Commission in the near future—in connection with the choice of drugs to be used for curative or prophylactic mass treatment.

Among those drugs, quinine still ranks first in current practice, by reason of its clinical effectiveness and almost complete absence of toxicity, coupled with the widespread knowledge of its use and dosage. As regards the synthetic products, which have only been used in therapeutics for ten years, the commission hopes that it has discharged the duty which devolved upon it by giving in this Fourth General Report an account of the present state of our knowledge regarding the possible use of *atebrin* and *plasmoquine* in the treatment and prophylaxis of malaria. In certain circumstances, as has been shown above, these drugs—representing a notable scientific advance—possess a very special value.

Sulphanilamide in the Treatment of Gonorrhœa

By HAROLD ORR, O.B.E., M.D., D.P.H., F.R.C.P. (C.)
(Abstracted from the *Canadian Medical Association Journal*, Vol. XXXVII, No. 4, October, 1937, p. 364)

THE MODE OF ACTION OF SULPHANILAMIDE

LONG and BLISS have shown that a 1:10,000 concentration of para-amino-benzene-sulphonamide in serum broth markedly inhibited the growth of alpha hæmolytic streptococci, gamma streptococci, pneumococcus types I and II, several varieties of Neisseria from the

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throat, *M. tetragenus, H. influenzæ and H. hæmolyticus.* The growth of *S. aureus, B. typhosus, B. para-typhosus A, B. para-typhosus B,* enteritides, Flexner, Shiga and several other Gram-negative bacilli, was not affected by this concentration of the chemical. This inhibition may also occur *in vivo,* but in addition to this effect of the drug it is felt that the micro-organism must also be damaged to permit of a marked degree of phagocytosis by the leucocytes. On the other hand, the experiments of Mellon, Gross and Cooper showed no indication that phagocytosis is a factor in the mechanism of the therapeutic action of this drug, and this seems to be borne out by the fact that the pustular discharge in acute gonorrhœal urethritis begins to diminish about four hours after the ingestion of large doses of sulphanilamide. The question of the mode of action is therefore unsettled.

Toxicity.—All of our 134 adult patients tolerated 80 grains of sulphanilamide daily for four days without ill effect. It is known that some patients have tolerated ¾ of a grain per pound of body weight daily for a month without serious results. Six of our patients developed skin rashes during the period of maximum dosage. In all six the eruption occurred after exposure to sunlight and was confined to the hands and face, there being sharp lines of demarcation at the rim of the collar and the bottom of the sleeves. In four of the patients the eruption was urticarial, in one a mixture of urticaria and dermatitis, and in one dermatitis only. The urticaria cleared up within twenty-four hours after discontinuing the drug and did not recur when the medication was resumed with half the former dosage.

All of our patients were conscious of a drug effect, which varied from a slight feeling of dizziness or lassitude to a definite inability to do work which required mental concentration. Headache, when it occurred, was not severe. There were no cases of acidosis and only two of fever (routine temperatures were not taken). One patient developed a condition suggestive of methæmoglobinæmia, which disappeared in a few hours when the drug was stopped and did not recur when treatment was resumed with a smaller dosage. Complete blood counts have been done on more than one hundred of our patients and no changes attributable to the treatment have been noted. The gastric analysis in 8 of our failures showed normal acidity. No renal changes were noted. It should be borne in mind however that in case of renal impairment retention of the drug in the blood occurs. In short it would appear from the study of the literature and from personal observation that sulphanilamide is relatively non-toxic.

Absorption and excretion.—Marshall, Emerson and Cutting have shown that in the dog absorption from the gastro-intestinal tract is rapid, being usually complete or nearly complete in four hours. In patients when large amounts of sulphanilamide are administered daily in divided doses nearly 100 per cent may be recovered from the urine when equilibrium between intake and output is established. It takes from two to three days to establish this equilibrium and the same time to free the body of the drug after it is discontinued. Subcutaneous injection of the substance does not lead to higher blood concentration than when it is given by mouth. It passes readily into the tissues and is found in the cerebro-spinal fluid in only slightly less concentration than in the blood. The optimum concentration in the blood stream is 1:10,000 and this is easily obtained by rather large initial doses of the drug and is maintained by considerably smaller doses. A method for determining the blood level has been described by these authors and more recently a simpler and more sensitive modification has been described by Marshall. The human subject excretes the drug partly unchanged and partly conjugated in the form of an acetylated derivate.

CLINICAL OBSERVATIONS

Sulphanilamide treatment of 51 male patients was begun on 15th May, these being the ordinary clinic run of patients attending on that day, and no selection of patients was made. Some had resisted the ordinary clinic treatment for months, and the common complications of the disease were represented in this preliminary group, including 1 of acute prostatitis, 5 of chronic prostatitis, and 1 of epididymitis. From day to day additional cases were started on sulphanilamide, to bring the total of this series to 30 females and 104 males. The diagnosis of gonorrhœa was confirmed routinely in each case by the demonstration in the laboratory of typical intracellular diplococci in the methylene blue stained smear of the urethral discharge. In the females smears were also made from the cervix. This was checked by the independent examination of duplicate smears stained by Gram's method in the Provincial Laboratory. Of the 30 female cases in this series all had positive smears within the five days preceding the institution of the sulphanilamide treatment. All the patients were ambulatory except one with acute prostatitis.

Of the males the first 51 of the series varied as to the duration of the disease from one day to several months; the succeeding 53 cases were all recently acquired infections of from one to five days' duration and coming under treatment for the first time. In the entire series of 134 adult cases the treatment consisted of: (1) 80 grains of sulphanilamide daily for the first four days; 40 grains daily for the second four days and 20 grains daily for the next seven days. The daily dose was divided into four equal portions and given every four hours from 8-00 a.m. to 8-00 p.m. (2) Each patient was instructed to drink large quantities of water and milk; all other fluids were prohibited. Other than this no instructions were given as to diet. (3) No local treatment of any kind was administered to any of these patients. Other patients treated in the clinic but who disappeared before completing the course, even though they appeared to be cured, have not been included in this series.

The cured patients have been followed for periods varying from one month to more than three months subsequent to the conclusion of the treatment. Relapses have occurred up to three weeks following an apparent cure, and although re-infection could not be ruled out these cases have been listed with our failures. Five of our uncured patients were placed in hospital, and for a period of five days were given prontosil subcutaneously in doses of 10 c.c. every four hours, or a total of 250 c.c. for each patient. In four of them the disease was not influenced by the treatment; the fifth case was very much improved but not cured. Our determination of a cure in the male was based on the absence of gross pus or shreds in the first and second glasses of urine and by the demonstration of not more than eight pus cells per oil-immersion field in the prostatic fluid; in the female by a series of not less than ten negative daily smears from the urethra and cervix.

Of our total of 134 cases 87.3 per cent were cured. Of the 104 males 91, or 87.5 per cent, were cured, 6 in one day, 13 in two days, 25 in three days, 14 in four days, 8 in five days and 25 in six to fifteen days; of the 30 females 26, or 86.6 per cent, were cured, but it is difficult in the females to decide just when the cure was effected. The females were seen and smears were made daily, some for as long as two months. In all cured cases the smears became negative within two weeks and symptoms of the disease disappeared. Of the 17 failures in this series not one seemed to be influenced by the drug. No complications whatever occurred in any of our patients during treatment.

One should approach the task of evaluating the curative effect of a new drug with an attitude of scepticism. Too often brilliant therapeutic successes have in the end proved to be due to optimism on the part of the observer. Many more cases will have to be observed over longer periods of time before a final decision can be reached, but the preliminary results would seem to indicate that sulphanilamide is of outstanding merit in the treatment of gonococcal infections.

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SUMMARY

1. Twenty-six, or 86.6 per cent, of 30 females and 91, or 87.5 per cent, of 104 males affected with gonorrhœa were cured within fifteen days by a course of treatment consisting solely of the oral administration of sulphanilamide and large quantities of fluids.

2. No complications occurred in any of the patients in this series subsequent to the commencement of sulphanilamide therapy.

3. The total dosage of sulphanilamide given to each patient was 620 grains during a period of fifteen days.

4. The drug sensitizes some patients to sunlight which produces an acute urticarial eruption on the exposed skin.

Sulphanilamide in Gonorrhœa

(From the *British Medical Journal*, Vol. II, 6th November, 1937, p. 918)

THE treatment of bacterial infections with sulphanilamide and related substances was discussed last week at the Royal Society of Medicine, when Dr. Leonard Colebrook drew attention to some of the toxic effects that may arise. Dr. G. A. Buttle in an account of experimental work said that the gonococcus was as susceptible to sulphanilamide *in vitro* as the meningococcus, and for the moment interest is focused on the possibility of treating gonorrhœa with this drug. Since the demonstration by Proom that sulphanilamide is effective against experimental infection with the meningococcus, it has been assumed for the purpose of therapeutic trial that the gonococcus is also susceptible, and the truth of this assumption is now confirmed by Levaditi and Vaisman. These authors have succeeded in producing what appears to be true infection by the gonococcus in mice by the manœuvre, suggested originally by Miller and Castles, and used by Proom in his work with meningococcus, of adding mucin to the inoculum. On the clinical side there are now several favourable reports. It appears from his study that most cases both of acute and of chronic gonorrhœa respond rapidly to the treatment, while a few seem entirely resistant to it. It is not clear that this resistance depends altogether on the anatomical location of the disease, and since the gonococcus is, serologically at least, a heterogeneous species, it may well be that resistance to sulphanilamide is a property of certain types of this organism. This is one of several matters which await investigation, not the least of which is the later results of the treatment. Dr. Cokkinis's report, like others which have already appeared, is of a preliminary nature. Meanwhile, there is news from Germany of further progress in this direction. Grutz, having experienced complete failure in the treatment of gonorrhœa with prontosil, and moderate success only with prontosil album (sulphanilamide), reports successful clinical trials of four new compounds which are said to be of similar nature; their actual composition is undisclosed and they are not yet available commercially. It cannot be emphasized too strongly that treatment with sulphanilamide requires close and expert supervision; success is evidently dependent on heavy dosage, which demands careful control if various toxic manifestations are to be avoided. These, according to numerous accounts, include, besides sulphæmoglobinæmia, which is now almost familiar, a skin rash and fever about the seventh day of administration, bone marrow changes leading to anæmia or even a fatal agranulocytosis, and optic neuritis. These more serious effects are fortunately rare, but it is nevertheless necessary when this drug is given that every facility should exist for their early recognition. The possibility of self-administration envisaged by Dr. Cokkinis when the public comes to recognize that gonorrhœa can be cured by swallowing tablets is alarming, and the sooner sulphanilamide and allied compounds are scheduled as dangerous drugs the better. Another warning appears necessary at this stage. The constantly expanding sphere of useful application of this drug may easily lead to its being looked upon as a 'cure-all' for infections generally. Although, as Dr. Cokkinis points out, it may have a remarkable effect in a great variety of conditions, it must not be supposed that all cases of the diseases he mentions will respond to it. Susceptibility to this treatment is not a property of certain diseases in the anatomical sense, such as otitis, arthritis, and peritonitis; it is dependent on the identity of the micro-organism causing them, and an exact bacteriological diagnosis is necessary to intelligent therapy. The bacteria which have so far been shown to be susceptible to sulphanilamide are *Streptococcus pyogenes*, certain members of the coli-typhoid group, the meningococcus, and the gonococcus. The possibility of controlling pneumococcal and staphylococcal infections either with sulphanilamide or with other related compounds which are now being studied is still in doubt, and other bacteria, so far as is known, are insusceptible. The microbic rather than the regional diagnosis is thus the factor governing success or failure, and no observations which neglect this will add usefully to our knowledge of this remarkable remedy.

Prontosil and Similar Compounds in the Treatment of Puerperal Hæmolytic Streptococcus Infections

By G. F. GIBBERD, M.S., F.R.C.S., M.C.O.G.

(From the *British Medical Journal*, Vol. II, 1937, p. 695)

SINCE 1936 prontosil and similar compounds have been used extensively in the treatment of puerperal infections due to the hæmolytic streptococcus. Fuller has studied the chemical changes which prontosil undergoes in the body, and he has suggested that the active part of its molecule is sulphanilamide, so that the latter (simpler) compound probably acts in the same way as the more complex. At the isolation block of Queen Charlotte's Hospital prontosil was used in the first part of 1936, and streptocide (a preparation of sulphanilamide) has been employed since. As it is my purpose to study the clinical value of this group of drugs as a whole, I have drawn no distinction between the earlier cases treated with prontosil and the later cases treated with streptocide. I have referred to these drugs collectively as the 'new aniline derivatives' and to their use as the 'new chemotherapy'. Prontosil has been given by intramuscular injection and by mouth in daily doses of 20 to 60 c.cm. (0.5 to 1.5 grammes) intramuscularly, and 6 to 12 tablets (2 to 4 grammes) by mouth. Streptocide has been administered by mouth in daily doses of 8 to 20 tablets (2 to 5 grammes). The maximum doses have been given to patients who appeared to be severely ill, and these doses have been continued until clinical improvement has occurred. After this the dose has been decreased, but smaller amounts have usually been used for as long as a week after the temperature has fallen to normal.

THE NEW CHEMOTHERAPY

Some patients have developed marked cyanosis due to met- or sulph-hæmoglobinæmia, but in no case has this complication given rise to anxiety, and it has always disappeared on withdrawal of the drug. In a few cases of severe infection the use of the drug has been continued in spite of the cyanosis without any untoward effect. There does not seem to be any constant relation between the dose administered and the tendency to develop cyanosis. Apart from cyanosis no serious ill effects have followed the giving of these drugs.

These aniline derivatives have been used at the isolation block of Queen Charlotte's Hospital since January 1936, and I have to thank my colleagues on the clinical and laboratory staff for allowing me to report upon all the patients with hæmolytic streptococcal infections of the birth canal who were admitted from January 1936 until March 1937. It is now a routine practice to employ one or other of these drugs

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in every case of hæmolytic streptococcal infection, but in the early part of 1936 there were some twenty patients to whom they were not given because of the mildness of the infection. These cases are included together with those treated by drugs during 1936-37 because I wish to show broadly what changes there have been in the results at Queen Charlotte's isolation block since the introduction of the new drugs rather than to give details of cases treated. As I have said it is not my intention to make any comparison between the earlier cases treated with prontosil and prontosil soluble and the later cases treated with sulphanilamide. The first group has already been reported upon by Colebrook, Kenny, and the staff of Queen Charlotte's Hospital. The second group will be the subject of a report to the Therapeutic Trials Committee of the Medical Research Council, and this report will subsequently be published. I have also given the results of cases of hæmolytic streptococcal infection admitted to the isolation block in the two years immediately preceding the introduction of the new drugs (1934-5).

There are thus two groups of patients to compare. The outstanding difference in the treatments in these two groups is that the new aniline derivatives were used almost as a routine in the one group and not at all in the other.

North-Western Fever Hospital, London, in spite of the fact that the new treatment was not used in that hospital, and they quoted Mr. James Wyatt's figures in this connexion. They pointed out, however, that the fall in mortality rate at the North-Western Fever Hospital had been progressive over a number of years, whereas there had been no such progressive fall at Queen Charlotte's. The fall from about 20 per cent to 4.7 per cent which they quoted from Queen Charlotte's was abrupt, and coincided with the introduction of prontosil into the scheme of treatment.

STREPTOCOCCAL INFECTION OF BIRTH CANAL AND ADJACENT TISSUES

Table I (*b*) shows that so long as the hæmolytic streptococcus is confined to the birth canal there is practically no mortality in either group; and table I (*c*) illustrates that even when the infection has spread to surrounding pelvic and lower abdominal tissues the patient almost invariably recovers, provided that widespread dissemination by the blood stream or by spread all over the peritoneal cavity does not occur. (The one death in the 1936-7 group which occurred in the absence of general peritonitis or septicæmia was due to a pulmonary embolus.) For proof that the infection has spread beyond the limits of the birth canal

TABLE I

Results of puerperal infections due to the hæmolytic streptococcus

	1934-5 GROUP			1936-7 GROUP		
	Number of cases	Deaths	Mortality, per cent	Number of cases	Deaths	Mortality, per cent
(*a*) Total number of puerperal infections due to the hæmolytic streptococcus	210	42	20	157	7	4.5
(*b*) Total number of infections clinically limited to the birth canal	98	0	Nil	104	0	Nil
(*c*) Total number of infections showing definite clinical evidence of localized spread beyond the limits of the birth canal (excluding septicæmia and generalized peritonitis)	50	0	Nil	30	1	3.3
(*d*) Total number of infections in which the hæmolytic streptococcus was demonstrated on blood culture (excluding cases in which generalized peritonitis was also proved)	28	11	40	21	5	20
(*e*) Total number of infections in which generalized peritonitis was proved to be present (excluding cases with septicæmia) ..	18	15	83	1	0	Nil
(*f*) Total number of infections in which both septicæmia and generalized peritonitis were proved to be present	16	16	100	1	1	100

Table I (*a*) shows that the gross mortality in the 1934-5 group was 20 per cent, compared with a mortality of 4.5 per cent in the 1936-7 group. The reduction in the mortality rate during the period when the new drugs were used is very striking. In their original reports Colebrook and Kenny considered the significance of these improved results, and were cautious in attributing them entirely to the treatment with the new drug. They drew attention to the fact that there had been a progressive fall in the mortality rate from hæmolytic streptococcal infections admitted to the

(apart from proved septicæmia or generalized peritonitis) reliance has been placed on the finding of a definite inflammatory mass in the pelvis or abdomen, and only cases in which such a mass has been demonstrated either clinically or at post-mortem examination have been classified under this heading.

These figures—table I (*c*)—show that the hæmolytic streptococcus is 'virulent' only in so far as it is invasive, and that a very large amount of tissue can be infected without causing death from absorption of toxins. In comparing the two groups of patients it will

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be noted that in the 1934-5 group the infection was clinically limited to the birth canal in only 47 per cent of the cases. In the 1936-7 group the infection was clinically limited to the birth canal in 66 per cent. This may be interpreted in one of two ways. Either the prevalent hæmolytic streptococcus of 1936-7 was less invasive—that is, less 'virulent'—than that of 1934-5 or else the chemotherapy of 1936-7 helped to prevent the invasion of tissues around the birth canal.

In many cases of localized spread of infection beyond the limits of the birth canal it is difficult to say precisely when a definite inflammatory mass was demonstrated. Clinically a 'sense of resistance' may give place to a 'thickening', and it may not be until several days later that an obvious 'lump' is found. In spite of this difficulty an attempt has been made to give a figure indicating the proportion of cases in which an inflammatory mass developed after admission to hospital, that is, after the institution of treatment. In the 1934-5 series forty-one of the patients (20 per cent) had a demonstrable inflammatory mass on admission to hospital, and an additional twenty-nine patients (14 per cent) developed a mass some time after admission. In the 1936-7 series an inflammatory mass was found in twenty-seven patients (17 per cent) on admission to hospital, and in nine patients (6 per cent) a similar mass developed after admission. There was therefore a notable reduction in the proportion of cases in which an obvious spread of infection occurred after admission to hospital in the period when the new drugs were employed. This may be evidence of the efficacy of the new chemotherapy, or, alternatively, it may be explained on the grounds that the virulence of the hæmolytic streptococcus was diminished in the 1936-7 period.

Mortality rates in septicæmia

Table I (*d*) shows the mortality rates in proven septicæmia (excluding cases in which general peritonitis was also proved). It was 40 per cent in the group of patients who did not receive the new drugs. Even 40 per cent may seem to be a surprisingly low mortality for blood-positive septicæmias due to the hæmolytic streptococcus, but in explanation of this I think that the care with which the bacteriological technique is carried out must be a factor in giving an (apparently) low mortality rate for cases in this class. If a less careful technique had been employed it is probable that some of the less severe septicæmias would not have been detected, so that although the total number would have been less the mortality rate would have been higher. This factor is of no importance in comparing the results in the two groups under review, because the technique of blood culture was identical in both. In the 1936-7 group the mortality for cases of proven septicæmia (excluding cases in which general peritonitis was also present) was 20 per cent; but before trying to assess the significance of this improvement it is useful to try to measure the severity of the cases in the two groups. Dr. Colebrook and his co-workers have, as a routine, estimated the number of organisms per cubic centimetre in the blood in cases of septicæmia, and as a general rule the clinically milder cases are associated with a lower count than the more severe. The records of these counts are not strictly comparable between various patients, because the number of organisms in the blood may vary greatly in different stages of the disease, and because blood cultures may be repeated more often in some patients than in others. Very roughly speaking, however, if the records show that a count of less than 10 organisms per c.cm. has not been exceeded at any time during the stage of pyrexia the septicæmia is probably 'mild'. The records of the cases at Queen Charlotte's Hospital show that the lower mortality from septicæmia in the 1936-7 period was associated with a relative increase in the proportion of 'mild' cases, in comparison with the 1934-5 period. This diminished invasion of the blood stream in the 1936-7 period is what we might expect to find if the new drugs were effective in checking the invasiveness of the hæmolytic streptococcus, but, alternatively, a falling off in the virulence of the prevalent hæmolytic streptococcus of 1936-7 would also manifest itself in the same way.

In the 1934-5 group a positive blood culture was obtained within twenty-four hours of admission in thirty-one cases (15 per cent) of all cases infected with the hæmolytic streptococcus. In the 1936-7 group the corresponding figure was twenty-two (14 per cent). In the 1934-5 group ten cases (5 per cent) developed a septicæmia some time after admission. In the 1936-7 group only one patient developed a septicæmia (and in this case the first blood culture was not taken until several days after admission). The incidence of septicæmia before admission does not greatly differ in the two groups, and this is some evidence that there was not any considerable difference in the invasiveness (virulence) of the prevalent streptococcus in the two periods. If this is so the diminished incidence of septicæmia developing after treatment with the new drugs is some evidence that the good results are due to the drugs rather than to a hypothetical decrease in the virulence of the infecting organism.

Generalized and generalizing peritonitis

Table I (*e*) and (*f*) gives the results when 'generalized' and 'generalizing' peritonitis occurred, but there are good reasons for exercising very great caution in interpreting these figures. The outcome of any peritoneal infection depends upon whether the tendency of the tissues to localize the infection overcomes the tendency of the organisms to generalize the infection, and the issue is often in the balance for some days. Unless laparotomy is performed, post-mortem examination is the only way in which a certain diagnosis of 'generalized' or 'generalizing' (as opposed to 'localized' or 'localizing') peritonitis can be made. The frequency and the readiness with which laparotomy has been employed at Queen Charlotte's Hospital has varied from time to time, so that the opportunities for proving a diagnosis of 'generalizing' or 'generalized' peritonitis have also varied. It is not necessarily of significance, therefore, that there were thirty-four such cases in 1934-5, against two cases in 1936-7. Changes in proved post-mortem findings are, however, significant. In the 1934-5 group (210 patients) generalized peritonitis was found post-mortem in twenty-nine cases. In the 1936-7 group (157 patients) it was found post-mortem in only one case. The relative rarity of this proved necropsy finding in the latter group must mean either that the invasiveness (virulence) of the prevalent streptococcus was very much less in the 1936-7 group or else that the new chemotherapy was very effective in preventing the widespread dissemination of the infection.

Results from the new chemotherapy

It is clear from the above analysis that since the introduction of the new chemotherapy there has been a very great improvement in the results obtained at the isolation block of Queen Charlotte's Hospital. The improved results are demonstrated: (1) by a considerable fall in the total mortality rate; (2) by a reduction in the proportion of cases in which the infection spread beyond the limits of the birth canal, and by the relative infrequency with which an inflammatory mass developed after treatment had been instituted; (3) by a significant fall in the mortality rate in cases of proved septicæmia associated with a relative decrease in the proportion of severe cases of septicæmia, and by a fall in the incidence of septicæmia developing after the treatment had been instituted; and (4) by the relative infrequency with which generalized peritonitis has been found post-mortem.

Conclusions

The new aniline derivatives have been employed at Queen Charlotte's Hospital since 1936; in the doses in which they have been given their use appears to be free from serious danger and has been followed by a very great reduction in the mortality rate for hæmolytic streptococcal infections. Analysis of the causes of this improvement in mortality rate shows that it is associated mainly with a decrease in the widespread

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invasion of tissues by the hæmolytic streptococcus rather than with a greater tendency to resolution of the disease once widespread invasion of tissues has occurred. This feature makes it necessary to consider whether the improvement since January 1936 is due to the efficacy of the treatment or whether it is due to a change in the virulence of the prevalent organism. It is possible that both factors may be concerned. In non-fatal cases in which tissues beyond the limits of the birth canal have been invaded by the hæmolytic streptococcus there is some clinical evidence that the new drugs do actually hasten the resolution of the inflammatory process, and this is a good reason for believing that the treatment, rather than a change in the virulence of the organism, is responsible for the improvement in this direction.

While I am unwilling to guess how far the new drugs have been responsible for the undoubted improvement which has followed their clinical use, there is every reason to continue to employ them until their value or otherwise is firmly established.

The Use of Expectorants

By C. L. BROWN, M.D.

(From the *Journal of the American Medical Association*, Vol. CIX, 24th July, 1937, p. 268)

AN expectorant may be defined as a medicine which aids in the removal of mucus or exudate from the lungs, bronchi and trachea. This action may be accomplished by causing a more active secretion, or by making the sputum more liquid or less tenacious. Another means of removal of sputum would be to stimulate the act of coughing, but this is seldom necessary or wise except in unusual states of debility in which large accumulations of sputum may actually imperil the patient. Often such a method would result in an expenditure of precious energy, and if possible aspiration should be employed instead. Coughing is nature's most efficient method of raising and ejecting sputum, and in some instances in which coughing is excessive, therapy must aim at controlling this act to allow the patient physical and mental rest and allow coughing at a time when it can be most efficacious.

To cough is to expel air, mucus or exudate from the lungs or air passages in a noisy, violent manner. When the respiratory mucosa is irritated by congestion, exudate or for some other reason, the nerve fibres transmit the impulse to the respiratory centre and the rather complex act of coughing is excited. Deep inspiration occurs, the glottis closes, and forced expiration is made. When the pressure becomes great enough to open the glottis, the sudden change in pressure is attended by the expulsion of a blast of air which characterizes the cough. If mucus or exudate is present in the lower respiratory tract it may be ejected with the air and the cough is 'productive'. If little or no exudate is present, or no sputum can be raised because of tenaciousness or for other reasons, the cough is said to be 'dry' or 'unproductive'.

In respiratory tract disease in which bronchial obstruction, diffuse or localized, is a part of the picture, there is a derangement of intrapulmonary and intrapleural pressures, the extreme of which is found in pulmonary emphysema. Mucus or exudate may cause partial bronchial obstruction to both inspiration and expiration. The forces of expiration are not as great as those of inspiration, and emphysema results from the accumulation of air in the alveoli and overdistention of their walls. Efforts to inspire air past the obstruction may be attended by increased negative intrapleural pressure, but if expiration is impeded greatly, as in obstructive emphysema, intrapleural pressure becomes elevated positively. In coughing, the forced expiration is accompanied by increased intrapulmonary pressure and elevated intrapleural pressure, simulating transiently the pressure changes found in emphysema, and, therefore, frequent prolonged unproductive coughing may be harmful. Since obstruction due to bronchial spasm or accumulation of sputum may respond to medication, these factors should be carefully evaluated in the selection of expectorants.

Indications for expectorants most often arise in inflammatory conditions of the lungs and larger air passages, and since the same expectorant may not be efficient or advisable in the different stages of the disease, the proper selection depends on a thorough understanding of the underlying pathological condition. In allergic manifestations, such as bronchial asthma and asthmatic bronchitis, the degree of bronchial spasm and the character of the accumulated secretion serve as excellent guides in the choice of therapy. The clinical interpretation of the pathologic process is aided greatly by the close observation of the type of cough and expectoration. Furthermore, the art and science of the prescribing of expectorants is dependent on appraisal of the type of cough, the character of the sputum, and the correlation with the stages and clinical features of the causative disease. Four rather distinct types of cough may be recognized: the hacking, irritative unproductive cough, the 'tight' cough with scanty or tenacious sputum, the wheezy, squeaking cough, which may be either dry or productive, and the 'loose' cough with abundant sputum. In consideration of the subject under discussion, sputum has three main constituents, water, mucus and purulent exudate, and in the individual case it is necessary to evaluate the relative proportions of these components. In the early congestive stage of acute tracheitis, and bronchitis, the cough is of the hacking, irritative, unproductive type. After a few hours or even as much as from one to three days later it may become a 'tight' cough with scanty or tenacious mucoid sputum. In some cases of acute bronchitis, the squeaking, wheezing cough develops. Later in the disease the sputum becomes more abundant and mucopurulent and the cough loose. Bronchopneumonia may provide a similar change in the cough and sputum. Lobar pneumonia often has a type of cough and sputum characteristic of the disease, but generally the early stage has a tight grunting cough with scanty, more tenacious, mucopurulent and rusty sputum, while in the later stages the cough is loose and there is abundant, more purulent, sputum. Chronic bronchitis produces a thicker mucopurulent sputum, which at times is tight, at other times loose, depending on the abundance of the sputum, on the relative amounts of pus and mucus, and on associated bronchial spasm, and at times the cough may have a wheezy character. The cough of congestive heart failure is often rather unproductive until secondary infection in the bronchi or lungs appears; then it simulates that of chronic bronchitis. If pulmonary œdema occurs, the sputum is abundant, watery and frothy, and may be blood tinged. The wheezing, squeaking cough is characteristic of bronchial obstruction and is the type found in asthma and asthmatic bronchitis, and here the sputum is scant at first, later more abundant, and is tenacious and contains varying amounts of mucus and pus, depending on an associated bronchitis. In chronic pulmonary disease a loose cough with abundant purulent sputum usually means pulmonary suppuration with cavity, such as lung abscess, suppurative pneumonitis or bronchiectasis. In the latter conditions, coughing occurs when the exudate reaches the irritable level in the air passages, since the deeper portions of the lungs are rather insensitive to stimulation; thus the reason for postural drainage in such cases. The odour of the sputum may be a very good index as to the prolonged retention in the suppurating area. Although older writings have described a characteristic cough and sputum of tuberculosis, it is now recognized that almost any of the types mentioned may be found in pulmonary tuberculosis, depending on the type of pathological process present. As a general rule the appearance of gross blood in the sputum of chronic pulmonary disease calls for pulmonary rest.

Since the beginning of medicine the patient with a cough has expected and often demanded a 'cough medicine' as part of the treatment. A review of old authoritative works on therapeutics reveals numerous drugs of one kind and another used for this purpose,

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a great many of them now obsolete, and provides an interesting historical background in therapy. Indeed, it would seem that the use of expectorants has been more of an art than a science.

Usually an expectorant is classified as 'stimulant' or 'sedative', and Sollmann has included a third group, the 'anodyne expectorants'. Perhaps such a classification serves some useful purpose, although it is difficult to list accurately the expectorant drugs under these three headings. There is some confusion in the definition of these terms; for example, one medical dictionary defines a stimulant expectorant as one 'used to expel secretions already formed'; one textbook on therapeutics refers to stimulant expectorants as those 'which are largely excreted in the bronchial mucus and which check the secretion or modify its character in some obscure way'; Fantus defines this class of expectorants as 'aromatic bodies that owe their virtue to elimination from the bronchial mucous membrane. Given in sufficient dosage, they possibly tend to favour healing by producing a curative hyperæmia'. Bethea, referring to Sollmann's classification, gives a practical correlation and clinical guidance as follows:

Sedative Expectorants: They are intended to soothe the acute inflammation mainly by stimulating the secretion of protective mucus. They may be nauseants, as ipecac; demulcents, as acacia or glycyrrhiza; salines, as ammonium chloride; alkalis, as ammonium carbonate. Irritant (stimulant) Expectorants: These are intended to irritate the mucous membranes in such way as to stimulate repair. They also tend to diminish excessive secretion. Some of these are also called aromatic expectorants. Typical of this group are terpin hydrate and creosote. Anodyne Expectorants: These are intended to depress the excessive cough reflex. These tend usually to diminish secretion. Codeine is typical.

Accordingly, the expectorant drugs official in the *U. S. Pharmacopœia XI* may be listed as in the accompanying table.

Expectorant drugs

SEDATIVE EXPECTORANTS—	Calcii creosotas
Ammonii chloridum	Guaiacol
Ammonii carbonas	Eucalyptol
Liquor ammonii acetatis	Oleum eucalypti
Potassii acetas	Oleum picis rectificatum (oil of tar)
Potassii citras	Syrupus picis pini
Sodii citras	Oleum terebinthinæ
Syrupus acidi hydriodici	Terebenum
Potassii iodidum	Terpini hydras
Calcii iodobehenas	Oleum pini pumilionis
Antimonii et potassii tartras	Syrupus scillæ
Apomorphinæ hydrochloridum	
Syrupus ipecacuanhæ	
Mistura opii et glycyrrhizæ composita (Brown mixture).	ANODYNES—
STIMULANT EXPECTORANTS—	Morphinæ sulphas
Creosotum	Codeinæ sulphas
Creosoti carbonas	Codeinæ phosphas
	Aethylmorphinæ hydrochloridum

Ammonium chloride.—Ammonium chloride causes the sputum to be more fluid and less tenacious and may increase the quantity. Therefore, it is useful in the 'tight' cough accompanied by scanty or tenacious sputum, and this is most often seen in the acute and subacute inflammatory conditions (bronchitis and pneumonia) and asthma. Ammonium chloride is not indicated in the chronic stages when the sputum has become more abundant and easy to raise. Its effect does not last long and it should therefore be given at frequent intervals, perhaps as often as every two hours, and usually the dose of 5 grains (0.3 gm.) is satisfactory. It should not be prescribed with alkali hydroxides or carbonates. The following vehicles are especially suitable for ammonium chloride: syrup of citric acid, syrup of cherry, syrup of wild cherry, syrup of acacia, syrup of tolu balsam and elixir of glycyrrhiza.

Ammonium carbonate.—The drug has much the same indications as does ammonium chloride, although it is more irritating to the throat and stomach and in large doses may act as a nauseant. With regard to dosage and frequency of administration, it should be used in much the same way as ammonium chloride. It is incompatible with acids and should not be prescribed with the syrups of acid reaction, such as those of citric acid, squill and ipecac. Although carbonates precipitate free alkaloids from aqueous solutions of most alkaloidal salts, codeine and atropine are not precipitated by ammonium carbonate.

Suitable vehicles for ammonium carbonate are syrup of acacia, elixir of glycyrrhiza and syrup of tolu balsam. Additional flavouring may be helpful in disguising the unpleasant taste, and for this purpose anise water, peppermint water and compound tincture of cardamom may be used.

Citrates and acetates.—Although some of the citrates and acetates have been used in the acute respiratory infections for their diuretic and indirect alkalinizing effect, they have been listed also among the expectorants, especially in larger doses, by many physicians. Representatives of this group of drugs are sodium and potassium citrates and solution of ammonium acetate and potassium acetate. When the citrates are to be used, the sodium citrate is commonly chosen and should be given in doses of 15 grains (1 gm.) every two hours, taken with at least 3 ounces (90 c.c.) of water. Either the sodium or the potassium citrate may be nicely prescribed in the syrup of citric acid or the syrup of orange. The acetates are somewhat less palatable and two common representatives of this group are solution of ammonium acetate and potassium acetate. The solution of ammonium acetate (liquor ammonii acetatis) is made from ammonium carbonate and acetic acid and should be used only when freshly prepared. The average dose is one-half ounce (15 c.c.) and is best given in one of the aromatic waters and flavoured syrups. Peppermint is especially recommended as a flavour. If acetates are to be prescribed, potassium acetate in 15 to 30 grains (1 to 2 gm.) doses in one of the aromatic waters and flavouring syrups is recommended.

Iodides.—Fantus states that 'iodide is the most powerful agent available for producing hyperæmia and exciting secretion of the respiratory mucous membrane', and 'therefore it is contra-indicated in acute bronchitis'. By the same reasoning it is contra-indicated in other acute forms of respiratory infection, such as the early stages of pneumonia. When the pathologic process is older and the sputum more tenacious, as in asthma or asthmatic bronchitis, the iodides may be very helpful. They are used against a thick sputum. Three official forms may be mentioned: potassium iodide, syrup of hydriodic acid, and calcium iodobehenate. The average doses given for these drugs are potassium iodide 5 grains (0.3 gm.), syrup of hydriodic acid 4 c.c., calcium iodobehenate 8 grains (0.5 gm.). If one considers only the iodine content in these drugs in the doses given, the amount of iodine is not comparable. the potassium iodide containing the most, the calcium iodobehenate being next, and the syrup of hydriodic acid containing the least. Potassium iodide is the simplest and most efficient form to prescribe if the iodide effect is desired. As saturated solution it may be given in five drop doses in milk after meals, or it may be prescribed in syrup of tolu balsam, syrup of orange, syrup of cherry or syrup of wild cherry, and syrup of pine tar. Syrup of hydriodic acid, in drachm (4 c.c.) doses every three or four hours, is prescribed ordinarily as such. The calcium iodobehenate is especially useful in cases in which potassium iodide causes gastric irritation and may be prescribed in its pure form without any vehicle.

Iodide should not be used in any case suspected of tuberculosis because of the danger of its increasing the activity of the disease.

Among the expectorants which are effective because of their nauseant action are ipecac, antimony and apomorphine. This group is indicated in acute respiratory infection in the early congestive stage when there is a 'dry' cough. The official preparations have been listed. Of these ipecac probably is the most used now

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and is especially employed in the acute laryngeal, tracheal and bronchial inflammations in children. The syrup of ipecac may be prescribed as such, the dose being from 5 to 12 minims (0.3 to 0.7 c.c.), or it may be combined with some other expectorant indicated in the early inflammatory stage. Syrup of orange and syrup of tolu balsam are suitable vehicles for ipecac. Antimony in some form was formerly used widely as an expectorant but has become less popular. Antimony and potassium tartrate is commonly employed, the dose ranging from 1/60 to 1/20 grain (1 to 3 mg.), and syrup of glycyrrhiza, of orange or of tolu balsam makes a satisfactory vehicle. A large part of the expectorant action of the compound mixture of glycyrrhiza (brown mixture) may be attributed to its antimony content. Apomorphine hydrochloride is most often given subcutaneously, the average dose being 1/60 grain (1 mg.), although a satisfactory effect may be obtained by mouth.

The stimulant sedatives are most useful in the chronic inflammatory conditions. They tend to lessen the mucus and exudate and the hyperemia caused by them may aid the healing process. They should not be used in the acute stage because of the tendency to produce hyperemia. Creosote compounds and terpin hydrate, both aromatic, are the representatives of this group which will be discussed here. Both calcium cresotate and creosote carbonate are satisfactory preparations and are used in much the same way. The average dose of calcium creosotate is 8 grains (0.5 gm.) and of creosote carbonate 15 grains (1 gm.). Doses should be smaller at first. Usually an interval of four hours between doses is satisfactory. These drugs are especially useful when the sputum is abundant, as in lung abscess, bronchiectasis and suppurative pneumonitis. Many patients indicate that the sputum becomes less objectionable in taste and odour after taking these. Calcium creosotate is best given in tablets. Creosote carbonate, in ascending (drop) doses, should be shaken up with milk.

Terpin hydrate is indicated in the chronic cough with abundant sputum and is said to be helpful especially against an excessive liquid sputum. It is commonly used in the form of elixir of terpin hydrate, which contains an insufficient quantity of terpin hydrate to give the best effect. For the full effect it is better to give terpin hydrate in capsules containing from 2 to 5 grains (0.13 to 0.3 gm.) three or four times a day. Elixir of terpin hydrate serves as a suitable vehicle for codeine.

Squill, not an aromatic but classified as a stimulant expectorant, has been used considerably in acute bronchial inflammation of children and in 'spasmodic croup', as the syrup of squill, usually in doses of from 15 to 30 minims (1 to 2 c.c.). At one time it was also said to be helpful in the 'winter bronchitis' of the aged. In the latter instance its good effect no doubt was related to the cardiac element in the so-called bronchitis. The syrup contains sufficient squill, if given in frequent doses, to produce some 'digitalis-like' effect and this should be kept in mind in its usage. The syrups mentioned are suitable vehicles, and other expectorants are sometimes added. Ammonium carbonate should not be put in syrup of squill.

The anodyne expectorants, so called, hardly need any comment, except to caution against their use in cases in which there is abundant purulent sputum. The purpose of the cough is to get rid of this exudate, and suppression of the cough reflex may be hazardous. Nevertheless, they are useful in giving the patient rest if coughing in such cases has tended to cause exhaustion. These drugs act by allaying the cough reflex, and the dose and frequency of administration are an individual problem. Codeine sulphate or phosphate are ones of choice; morphine should be avoided in treatment of the chronic cough because of the danger of addiction. However, there are occasions when good clinical judgment may dictate its use for temporary relief.

Diffuse partial bronchial obstruction as exemplified in bronchial asthma and asthmatic bronchitis presents a special problem in the use of expectorants. Both bronchial constriction and plugging by tenacious mucus enter into this mechanism. Solution of epinephrine 1 : 1,000, in doses of from 3 to 12 minims (0.2 to 0.7 c.c.) given intramuscularly, is the most effective remedy for the bronchial spasm. Ephedrine hydrochloride and sulphate have a more prolonged effect and have the advantage of oral administration but are less certain to give relief. The ephedrine compounds in capsules are satisfactory, although they may be put in liquid preparations. Stramonium and belladonna, usually given as the tincture in a vehicle and often combined with some other expectorant, tend to diminish the quantity of the bronchial secretions. Potassium iodide is helpful in combating tenaciousness of sputum.

The availability of so many expectorants may cause difficulty in choice for a particular case. Most of the therapeutic demands can be satisfied by skilful employment of a few representative drugs such as ammonium chloride, potassium iodide, syrup of ipecac, calcium creosotate, terpin hydrate, codeine phosphate, epinephrine, ephedrine sulphate and tincture of belladonna. The selection of a suitable vehicle may be of no little importance in commanding the respect and co-operation of the patient. Syrups of acacia, tolu balsam, cherry, wild cherry and citric acid and elixir of glycyrrhiza furnish a fairly adequate choice.

Of the accompanying typical prescriptions, 1, 2 and 3 are to be used in acute or subacute inflammatory conditions (acute bronchitis, pneumonia) at a time when the cough is 'tight' and the sputum is scanty.

Prescriptions 4 and 5 are to be used in subacute or chronic inflammatory conditions when the sputum is thick, tenacious and more abundant. (Caution: Not to be used in tuberculosis.)

Prescriptions 6 and 7 are to be used in acute inflammatory conditions when the cough is dry or the sputum scanty.

PRESCRIPTION 1.—*For acute bronchitis or pneumonia*

℞ Ammonium chloride	.. ..	10 gm.
Elixir of glycyrrhiza	.. ..	60 c.c.
Syrup of acacia	.. to make	120 c.c.
M. S.: One teaspoonful in half a glass of water every two hours.		

PRESCRIPTION 2.—*For acute bronchitis or pneumonia*

℞ Ammonium chloride	.. ..	10 gm.
Syrup of citric acid	.. to make	120 c.c.
M. S.: One teaspoonful in half a glass of water every two hours.		

PRESCRIPTION 3.—*For acute bronchitis or pneumonia*

℞ Ammonium carbonate	.. ..	10 gm.
Compound tincture of cardamom	..	30 c.c.
Syrup of tolu balsam	.. to make	120 c.c.
M. S.: One teaspoonful in half a glass of water every two hours.		

Prescription 4.—*For subacute or chronic conditions*

℞ Potassium iodide	.. ..	10 gm.
Syrup of tolu balsam	.. to make	120 c.c.
M. S.: One teaspoonful three times a day, after meals.		

PRESCRIPTION 5.—*For asthma or asthmatic bronchitis*

℞ Potassium iodide	.. ..	15 gm.
Tincture of stramonium	.. ..	20 c.c.
Syrup of tolu balsam	.. to make	120 c.c.
M. S.: One teaspoonful three times a day, after meals.		

PRESCRIPTION 6.—*For children*

℞ Syrup of ipecac	.. ..	5 c.c.
Syrup of orange	.. to make	60 c.c.
M. S.: One teaspoonful every three hours as necessary for cough.		

PRESCRIPTION 7.—*For acute conditions*

℞ Compound mixture of opium and glycyrrhiza	.. ..	120 c.c.
S.: One teaspoonful every three hours as necessary for cough.		

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Reviews

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THE BLOOD AND ATLAS OF HEMATOLOGIC WITH CLINICAL AND HEMATOLOGIC ONS OF THE BLOOD DISEASES A SECTION ON TECHNIC AND LOGY.—By R. R. Kracke, M.D., and H. E. M.S. 1937. J. B. Lippincott Company, phia and London. Pp. xviii plus 532 44 coloured plates and 17 other Price, 65s. Obtainable from tations. Butterworth and Company (India), Limited, s. Price, Rs. 48-12

[illegible] hæmatological renaissance, which dates from the [illegible]portant work of Minot, Castle and others on pernius anæmia and Witts, Mackay, and Vaughan on [illegible]e iron-deficiency anæmias of women and children, provides an interesting study for the medical historian. Some information might be obtained from a comparative study of the medical literature of ten years ago and of to-day. The successful book on hæmatology of the last generation was an atlas with a series of plates and short clinical descriptions, but with little attempt at classification or systematic arrangement of the material and no discussion on ætiology: in contrast to this, during the last few years, two, at least, of the best books on the subject have contained no plates, and the emphasis has been entirely on ætiology, on which the present-day classification is based.

From this point of view the publication of the present volume is a retrograde step, in that it is an hæmatological atlas: it is, however, a modernized hæmatological atlas and it will certainly fill a demand, even if this demand is not one that should be encouraged. The 44 full-page coloured plates are on the whole very satisfactory indeed. (The technical difficulties in the way of the production of *perfect* pictures of blood cells are at present insurmountable.) It would be easy to criticize individual plates or individual cells with such a vast choice, but if one picture does not satisfy one's idea of what the particular cell should look like, usually some other picture does. This was the reviewer's experience, with one exception; nowhere did he find a really satisfactory megaloblast.

The classifications given are in accordance with the modern tendency, but the arrangement of the material and the order in which the different disease syndromes are discussed seem to depend more on chance than on reason.

The chapter on technique is useful. With the wide scope for individual preferences criticism is again easy; however, we cannot see eye to eye with the writers on their method of sternum puncture, for example, they suggest the use of a mallet to pierce the anterior plate of the sternum (they are tough, mighty tough in the West!). They recommend the withdrawal of 10 c.cm. of fluid: there is no difficulty in obtaining this amount, but it will mean considerable dilution of the marrow blood from the circulation, and we can think of no examination that cannot be done with 2 c.cm.

In conclusion, we can say that the book is a useful addition to the literature as it contains an immense amount of valuable information and some good plates. We do not however recommend it to the young student of hæmatology lest it should lead him back into the old circular paths that lead through fields of morphological minutiæ and cell genealogy back to the starting point, but we do believe that the trained worker will find it a very useful addition to his laboratory reference books.

L. E. N.

MINOR MALADIES AND THEIR TREATMENT.—By L. Williams, M.D. Seventh Edition. 1937. Baillière, Tindall and Cox, London. Pp. xiii plus 439. Price, 10s. 6d.

LEONARD WILLIAMS is an experienced and facile writer; he is always a pleasure to read; and he is as near to being the ideal writer for the general practitioner as it is possible to be. As an editor and a writer in journals, he was always readable and amusing, though sometimes trivial, but in his *Minor Maladies*, a book which has now reached its seventh English edition, which long ago achieved classical rank, and which has been translated into both French and Spanish, he is at his very best.

A book of this kind is not quickly out-dated in the way that most textbooks are, so that much that appeared in the earlier editions still remains, but it has been polished and repolished so that it shines like pure gold in contrast to the dull base metals of the ordinary textbooks—and, we fear we must add, of some of the newer chapters of this volume.

He describes the *difficile* pre-tuberculous patient as 'not necessarily aggressive' but as showing a conspicuous absence of 'sweet reasonableness', as masterly a euphemism as the classical parliamentary 'terminological inexactitude'. Later, in the same chapter he reminds us that the sexual excesses of the reprobate youth who afterwards falls a victim to tuberculosis may have been caused by, rather than the cause of, early tuberculous infection. [It is difficult for us to shake off the shackles placed on our consciences by dishonest moral and religious teachers, who attempted to frighten us in our youth by emphasizing the avenging character of our god, or gods, and honestly to face the fact that the muscular excesses of a rowing 'blue' are likely to leave more scars on his physique than are the sexual excesses of the most unprincipled and most favoured youth.] The author considers that frequent colds do not predispose to tuberculosis but are rather an indication of the life these individuals lead—'who, in short, live thoroughly unwholesome, coddling [Why not coddled?] lives, and thus cultivate within themselves an atmosphere, both physical and moral, in which the bacillus flourishes and multiplies exceedingly'. This is to a certain extent true, but it is not by any means only the coddled, or self-coddling, individual that is a 'martyr' to colds in the head or falls a victim to tuberculosis. On the other hand, we agree that 'the small ragged tonsils of an adult who no longer complains of sore throats are often more likely to require removal than the large succulent tonsils of a child'.

The chapter on minor dietetics is disappointing, though it contains many valuable truths. The author is inclined to rant against the 'modern dietitian', by which he really means the pseudo-dietitian. Modern dietetics has supplied a large number of incontrovertible facts based on accurate experiments, and if these facts are distorted by charlatan physicians or unprincipled commercial concerns it is scarcely the dietitians' fault. Further, we cannot agree with some of his rather dogmatic statements, *e.g.*, on the relative value of food of animal and vegetable origin, and his advice to the physician to ignore calories.

Nevertheless, the book is still a classic and should be read by every doctor after he passes his final examination and before he sees his first private patient, and again and again unless he has an exceptionally retentive memory.

L. E. N.

A TEXTBOOK OF MEDICINE.—By American Authors. Edited by Russell L. Cecil, A.B., M.D., Sc.D. Fourth Edition. 1937. W. B. Saunders Company, Philadelphia and London. Pp. xx plus 1614. Illustrated. Price, 40s.

THIS textbook appears to have been one of the most successful of its kind in recent years and through its four editions has maintained its vital character. This can probably be accounted for by the multiplicity of the contributors, the frequent rewriting of sections, often by new contributors, and the addition of new sections on subjects that have recently assumed a greater importance. Though there are well over a hundred contributors, no lack of homogeneity is obvious.

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The sections on tropical diseases are written in almost every instance by workers whose names are associated with these diseases through some original investigation that they have carried out, *e.g.*, Bass on malaria, and Wolback and Pinkerton on the typhus group. Other sections are also written by well-known experts.

A surprising amount of well-arranged information has been crowded into the comparatively limited space allotted to each subject and the student or practitioner will find that he can acquire a very good outline of any medical subject from this volume.

Naturally, we have a few criticisms. The section on the treatment of malaria is very disappointing; it might have been written 30 or more years ago and touched up by the addition of the barest reference to the synthetic anti-malarials. The writer suggests the old 8-weeks' course of quinine and has not conveyed to the reader any idea of the unique properties of plasmochin.

In the typhus sections, classical typhus, Rocky Mountain spotted fever, trench fever, and tsutsugamushi disease are well described, but other typhus fevers are not taken into consideration at all. Nevertheless, tropical diseases as a whole get far better treatment than is usual in the one-volume textbook; for this and other reasons we consider it one of the best of the American textbooks on general medicine, both for the student and the practitioner.

L. E. N.

MALARIA AND ANKYLOSTOMIASIS IN THE PREGNANT WOMAN: THEIR MORE SERIOUS COMPLICATIONS AND SEQUELÆ.—By G. A. W. Wickramasuriya, F.R.C.P., F.R.C.S. (Edin.), M.C.O.G. 1937. Oxford University Press, London, Humphrey Milford. Pp. xii plus 179. Illustrated. Price, 10s. 6d. Obtainable from Oxford University Press, Bombay and Calcutta

THE author after years of practical experience in Ceylon is convinced that malaria and ankylostomiasis are very important factors in increasing the infantile and maternal mortality in that island. A reference to the textbooks and literature will show that most other workers in other tropical countries where these diseases are important are equally convinced of this same truth, most certainly as far as it applies to malaria.

It is of course very discouraging to set out to prove something that every one knows to be true if they only stop to think, it was therefore probably wise of the author to adopt the methods of the evangelist rather than those of the scientist in trying to drive home the truth to the unbeliever who will not pause and think. One of his favourite expressions is 'I am convinced beyond doubt that . . . ' and whilst in most cases one feels that he is almost certainly right one cannot help regretting that he has not produced any scientific data, but has been content to report one or two cases in rather tedious detail, which is not always convincing, before writing his conclusions, which conclusions often bear little relationship to the previous matter in the chapter, are rather in the nature of the author's creed, and should, one feels, begin with the words, 'I believe'. For example, a patient with long-standing nephritis, pregnancy toxæmia, a heavy hookworm infection, severe anæmia ('30 per cent' hæmoglobin) and malignant tertian malaria was, amongst other things, given atebrin and died during labour: this incident appears to have shaken the author's faith in atebrin and led him to the sweeping conclusion that 'atebrin would appear to be contra-indicated in subjects of toxæmic pregnancy, pre-existing nephritis, and advanced hookworm disease'.

Whilst one is usually in sympathy with the author's beliefs there are occasions when the rationale of his treatment is a little difficult to follow. Why, for example, did he think it necessary to give two intramuscular injections of 0.032 gramme of plasmochin in a case of severe malignant tertian malaria at a time when the patient was 'very ill'?

The author is on a little less certain ground when he deals with hookworm infection, but here he gives a comparative table which does sugg[illegible] (0.2 to 0.7 c.c.) ective remedy infection complicates pregnancy. T[illegible]ochloride and a few points in this table about whi[illegible]nd have the information. In his preface he says th[illegible]ss certain to cent of the inhabitants of Ceylon ha[illegible]capsules are infection, yet only 30 per cent of his [illegible] in liquid were 'hookworm positive'. Does this [illegible] usually latter were a selected population, or th[illegible]combined cluded lower degrees of hookworm infecti[illegible]nish the ing his table? There is no indication [illegible]n iodide author takes the view that, from a morbi[illegible] point, only heavy hookworm infections are cause or whether he adopts the argument of a certain[illegible] the helminthologist that as one egg in the stool spe[illegible] worm disease one need not worry unduly ab[illegible] actual numbers; although he does give egg cou[illegible] his case notes he gives one no idea of what hook load he considers pathogenic.

The anæmia caused by hookworm infection is a v[illegible] characteristic one and, even if complicated by pre[illegible] nancy, maintains much of its original character, s[illegible] that useful indications might have been obtained from the blood picture, but in no case is any detailed picture given, seldom more than the hæmoglobin percentage.

The book may be of value to obstetricians, and the author will certainly be able to say 'You have been warned' to his fellow practitioners in Ceylon and to obstetricians in other countries where malaria and hookworm occur, but one reader, at least, who is interested in the hæmatological aspects of anæmia in pregnancy and in the predisposing or causative rôles of these two infections in particular, found singularly little information of any value to him in this volume.

L. E. N.

THE MANAGEMENT OF THE PNEUMONIAS—FOR PHYSICIANS AND MEDICAL STUDENTS.—By J. G. M. Bullowa, B.A., M.D. 1937. Oxford University Press, London and New York. Pp. xvii plus 508. Illustrated. Price, 27s. 6d. Obtainable from Oxford University Press, Bombay and Calcutta

PNEUMONIA is a dangerous disease in any country; but its seriousness varies considerably from country to country, and it is in the United States of America that it is encountered in its most virulent form. In England—and probably elsewhere—pneumonia is known as 'the old man's friend', but in America old men apparently resent pneumonia's kindly services and prefer not to die. For these two reasons, in particular, an enormous amount of American money and the time of many of America's best scientists have been directed towards the reduction of the mortality from pneumonia. The results have been not a dramatic, but a very distinct, reduction in the mortality from this disease during the last decade or so.

In the book under review, after a preliminary chapter on classification and ætiology, the author goes straight to the bedside and discusses the problem of diagnosis, treatment, prognosis, etc., from data collected in his own experience and that at the Harlem hospital, and, though he lays particular stress on the fact that he has quoted only his own experience, his teaching is very much in line with the best American practice.

In treatment, emphasis is laid on the use of serum, particularly in type I pneumonia, in which in a large series, of nearly a thousand adults, the mortality has been reduced from 30 to 13 per cent. The importance of oxygen, given early and efficiently, is also stressed. As is usual in America, both alcohol and digitalis are condemned; alcohol is not recommended even in the case of the heavy drinker who has been used to a big daily dose.

The book is written for the student and the practitioner and will, we feel confident, be appreciated by both. Both will however find some of the tabulated data a little tedious, but they can easily skip this when reading the book. Also they may consider that some of the diagrams are slightly insulting to their intelligences; *e.g.*, figure 26 on p. 78 is distinctly more

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MARCH, 193- ular lecture than to a monograph ...cians. On the whole, however, the ...portant contribution and contains much ...mation: it is also very readable and is ... recommend to the practitioner for his ...

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L. E. N.

CEREBRO-SPINAL FLUID.—By H. Houston Merritt, M.D., and Frank Fremont-Smith, M.D. Philadelphia and London. W. B. Saunders Company, 1937. Pp. x plus 333. Illustrated. 22s. 6d.

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... the last years of the nineteenth century, ... ke introduced the examination of the cerebro-...l fluid withdrawn by lumbar puncture, and since ...a it has become an invaluable aid in clinical diag-...sis. It is now a routine method of investigation ...most in every variety of nervous disease.

This book has been written from an analytical study of over 2,000 cerebro-spinal fluids and the clinical record of the patients. It shows the range of normal values and the various changes that have been observed in different pathological conditions. Techniques such as lumbar and cisternal puncture have been well described in a practical manner. A long chapter deals with the cerebro-spinal syndromes, comprising a most heterogeneous group, such as, neurosyphilis, rabies, and trichinosis. The report of the fluids from 47 cases of spontaneous subarachnoid hæmorrhage with the tabulated results of four typical cases and similar data in various other conditions will prove very useful for reference. Therapeutic uses of lumbar puncture, röntgenography of the ventriculo-subarachnoid space and the biochemical methods have also been dealt with, thereby increasing the practical utility of the volume. Definite facts have been presented in such a way that one can match with considerable accuracy the findings of practically any case. There is an excellent bibliography and a differential diagnosis of the cerebro-spinal fluid in a tabulated form at the end of the volume. The book will undoubtedly prove very useful to those interested in nervous disorders.

R. C.

MEDICAL EMERGENCIES.—By C. Newman, M.D. (Cantab.), F.R.C.P. (Lond.). Second Edition. 1937. J. and A. Churchill Limited, London. Pp. x plus 150. Price, 8s. 6d.

THE distinction between a case which constitutes an emergency and one which does not is a little arbitrary. There are, of course, more surgical than medical emergencies, but, whereas in many surgical cases there are usually at any rate a few hours' grace, in medical ones treatment must frequently be instituted within minutes or seconds. For this reason, there seems to be scope for a purely medical volume. The publication of the second edition of this book further testifies to this fact.

The book begins with a chapter on poisoning, in which the symptoms and treatment of over sixty poisons have been described in about thirty-five pages. Such brevity, though desirable in a book of this type, is liable to misguide one to a wrong diagnosis. Next, the author deals with various emergent conditions such as Stokes-Adams' attacks, colics, pulmonary œdema, etc., with brief but useful and practical points in each. A few conditions, such as quinsy, eclampsia, threatened abortion, etc., which strictly speaking are not medical, have also been included; these will perhaps be appreciated by the general practitioner. But one is surprised to read in this book that it is the pneumonias and not blackwater fever which need quicker diagnosis and attention. In connection with the treatment of malarial coma it has been mentioned that one intravenous injection of quinine hydrochloride is sufficient to cure; one would hesitate to make such a bold statement. The author recommends this book to be used as a companion to his surgical volume.

R. C.

PRACTICAL PROCTOLOGY.—By L. A. Buie, A.B., M.D., F.A.C.S. 1937. W. B. Saunders Company, Philadelphia and London. Pp. 512 with 152 illustrations, some in colour. Price, 30s.

ANY notable publication by a senior member of the surgical staff of the Mayo clinic may be rightly expected to receive a cordial welcome. In a brief foreword, Dr. Charles Mayo records his appreciation of the author's work. This handy volume, consisting of 512 pages and 19 chapters, is based on the personal experiences of the author as the head of the department of proctology for a period of ten years. Although the presentation, in this book, of the newer methods and recent advances is commendable, yet a certain lack of fine adjustment and correct appraisement of importance in the treatment of the subject-matter would seem to detract from a deserving success. For instance, we are told that one out of every seventeen patients in the department of proctology had cancer of the terminal colon and anus, and one out of every four had received treatment for some other supposed ailment. Yet there are only two short paragraphs on operative treatment!

The first chapter deals with the indications for investigation and the technique of examination. The position that is recommended for the patient is the 'inverted position', which is not in general use in this country. The improved pattern of proctoscope has obvious advantages in having the circumference of the barrel made to correspond with that of the index finger. The next two chapters deal with surgical anatomy, pre-operative and post-operative treatment. It is of interest to note that, in the hands of the author, sacral block anæsthesia has been successfully used in more than 15,000 cases. The two succeeding chapters are devoted to the consideration of cryptitis, papillitis, anal fissure and fistula. Hæmorrhoids, rectal prolapse and anal pruritus are then discussed in some detail. To the difficult subject of ulcerative colitis a whole chapter has been devoted, and amœbic and bacillary dysentery have each been accorded a separate part. Other chapters deal with colonic diverticula and polypoid disease. The section on malignant disease of the rectum, taken as a whole, is inadequate and therefore disappointing. Although it is loaded with a mass of statistical figures, the vital subject of treatment is dismissed with scant attention, as, in the opinion of the author, any discussion of the merits of different types of radical operation would be outside the province of this volume. Yet there are several pages on radium treatment and fulguration! A brief account of the author's own surgical practice would have enhanced the value of this section. The chapters which follow deal with melanosis coli, rectal stricture, venereal diseases and rectal granuloma and pilodenal disease. The final chapter, which will be much appreciated, is devoted to dietary formulæ and prescriptions.

There will be general agreement that this is a book of considerable merit. It would be of value to the general practitioner, but to be of greatest utility to the practising surgeon it would require amendments to which reference has already been made. The printing, get-up, and illustrations are all excellent. There is also a useful index.

P. N. R.

A PRACTICE OF ORTHOPÆDIC SURGERY.—By T. P. McMurray, M.B., M.Ch., F.R.C.S. (Edin.). 1937. Edward Arnold and Company, London. Pp. viii plus 471. Illustrated. Price, 21s.

A PRACTICE of orthopædic surgery in 458 quarto pages of small pica with one hundred and seventy-eight illustrations is something of a feat, even if the extensive subject of fractures, as in this case, is omitted. The reviewer perhaps expects the word 'practice' to include more than it should. It is not clear for what class of reader the book is intended. The absence of discussion on operative treatment reduces its appeal to the specialist and while the subject is handled dogmatically the student will hardly find time to digest the contents in an already overcrowded curriculum.

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The book should find its best supporters among junior house surgeons beginning a specialist career. The practical side is stressed and while selected lines of treatment only are described these are given with clarity and precision. General practitioners requiring a succint guide to the possibilities of modern orthopædic surgery will find this book a readable and reliable guide. The *x*-ray reproductions are good and well chosen and none are indistinct. The author has avoided a redundancy of rare and peculiar specimens more suited to a monograph than a general handbook. Some of the outline drawings are crude and at least one in the peripheral nerve section is inaccurate. The price, 21*s.*, is somewhat high.

H. R. H.

BODY MECHANICS: IN THE STUDY AND TREATMENT OF DISEASE.—By J. E. Goldthwait, M.D., LL.D., L. T. Brown, M.D., L. T. Swaim, M.D., and J. G. Kuhns, M.D. Second Edition. 1937. J. B. Lippincott Company, Philadelphia and London. Pp. xiv plus 293, with 100 illustrations. Price, 18s. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 13-8

MUCH attention has been paid in recent years to 'body mechanics' in the study and treatment of disease. Body mechanics has been defined by the White House Conference on Child Health and Protection, 'as the mechanical correlation of the various systems of the body with special reference to the skeletal, muscular and visceral systems and their neurological association'. In the present volume, this important subject has been carefully discussed with the hope that in the better understanding of the special structure and physiology of the individual, the solution of the problem of chronic disease will be largely found. The condition of poor muscular tone and faulty carriage is seen not only in childhood but in all periods of life. During the world war, we are told, no less than 46 per cent of the young men of Massachusetts were considered unfit for active service.

The book under review consists of fourteen chapters of which the first three deal with general considerations of 'body mechanics'. In the next chapter the three familiar body types are discussed, due regard being paid to the differences of susceptibility to disease. In the four succeeding chapters, important subjects, such as backache, arthritis, diseases of the abdominal viscera, and of the circulatory and nervous systems, are considered from the aspect of 'body mechanics'. Two chapters are devoted to treatment which include planned exercises, retentive apparatus and muscle re-education. Some illustrative cases are briefly recorded and these will be found of interest. The two concluding chapters deal with visceral disturbances and also public health aspects of body mechanics.

It is, in fact, a book to read and ponder over. But it suffers from one great defect of having been written with such manifest enthusiasm as is likely to be mistaken for rank partisanship, akin to fanaticism. The authors have been led to ascribe to faulty body mechanics, the origin, in part at least, of malignant disease of the genital organs in the female (p. 47) and prostatic enlargement in the male (p. 115). They believe 'that faulty body mechanics with its increased demands upon the energy of the motor tracts, and with accompanying congestion of the cord, may play a part in the onset and development of the muscular atrophies' (p. 153). There is one inexplicable omission in that there is no reference to the baneful effects of modern footwear, particularly in the case of the female. The book has been written in clear and simple language, but there are some rather unfamiliar terms, such as 'mechanistic features', 'acute medicine', 'visceroptotic existence', etc. The printing, get-up and illustrations are excellent and the bibliography is exhaustive. The book is dedicated to the chronic patient.

P. N. R.

A MANUAL OF OBSTETRICS.—By [illegible] C.M. (Edin.), F.R.C.P. (Lond.), F.C.O.G., and E. Holland, M.D., F.R.C.P. (Lond.), F.R.C.S. (Eng.), Edition. 1937. J. and A. Churchill, London. Pp. xii plus 765, with 1[illegible] 398 illustrations in the text. Price, [illegible]

EDEN'S *A Manual of Obstetrics* has been [illegible] for over 30 years. As one cannot criticize [illegible] hesitates to praise it, beyond saying that [illegible] its own high standard in its eighth edition, [illegible] appearing to patronize two of London's [illegible] obstetricians, one is compelled to record addition [illegible] changes and in doing this one cannot do better [illegible] quote from the preface.

'In part I simplification of the sections on physiology has been made possible by the work of [illegible] past five years on the chemical purification of [illegible] ovarian hormones and, in general, on the endocrine [illegible] control of reproduction. The section on antenatal care [illegible] has been amplified and made more practical, and [illegible] modern views on diet during pregnancy are discussed.

In part II the section on the anæmias of pregnancy has been rewritten; so also has the section on pyelitis of pregnancy, in the light of radiological and therapeutical discoveries. The section on abortion contains the new work on endocrine and dietetic factors.

The sections on the aseptic conduct of labour and on obstetrical anæsthesia have both been expanded. Ergometrine comes in here—a drug of fundamental importance, which should replace the less safe posterior pituitary extract for routine post-partum use.

In part V (the puerperium) the new work on the sources and treatment of puerperal infections is probably of more fundamental importance than anything else in obstetrics during the last few years. This section has been almost entirely rewritten, and I believe everything of merit, including the grouping of the hæmolytic streptococci and chemotherapy by the prontosil group of drugs, will be found incorporated. Obstetric shock receives the attention it deserves.

In the treatment of asphyxia neonatorum the methods of artificial respiration have rightly fallen more and more into the background, whereas treatment by intratracheal insufflation has become more and more prominent.

Cæsarean section has been almost entirely rewritten and re-illustrated. The classical operation has been treated with the respect it merits; but the lower segment operation, which is slowly but surely rising into first place, has been given more space and a new set of illustrations'.

We will conclude by saying that we hope that his 'Eden' will still remain the bible of the present-day medical student: practitioners will find sufficient important changes in this book to justify the investment in a new edition.

TEXTBOOK OF GYNÆCOLOGY.—By W. Shaw, M.A., M.D. (Cantab.), F.R.C.S. (Eng.), F.C.O.G. Second Edition. 1938. J. and A. Churchill, Limited, London. Pp. viii plus 616, with 4 plates in colour and 253 text-figures. Price, 18s.

THE first edition of this book was published only two years ago and met with the immediate success that it deserved. The author is a teacher at one of London's leading hospitals and knows what the student needs. In his treatment of the subject he is both precise and concise without necessarily being dogmatic, and though the book is not an exhaustive treatise, the subject is covered quite sufficiently for the M.B. student and for the general practitioner.

A new chapter in this edition is the one on hormonal therapy. Ten years hence it may be easy to write such a chapter; at present it is difficult on account of the many gaps and uncertainties in our knowledge of the action of most hormones. They have a habit of 'doing those things they ought not to do and leaving undone those things they ought to do', as for example, though progestin is indicated theoretically in dysmenorrhœa, in practice it is of little use and, conversely, it is sometimes helpful in menorrhagia

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...le of its use is obscure. On the whole, well balanced and will be a useful ...subject.

...self is attractive, the print is large and ...ns numerous and very clear: there are ...ellent coloured plates. Altogether it is the ...or the student and practitioner, and makes ...able companion volume to Eden's *Manual*

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REACTIONS IN BONE AND DENTINE: A PHO-BIOLOGICAL STUDY OF THE FORMA- AND THE DISSOLVING OF BONE AND TINE.—By Ake Wilton, M.D. 1937. Henry ...npton, London. Pp. 194, with 64 figures and coloured plates. Price, 15s.

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In this book the author has summarized his observations on the changes in the bones and dentine which take place both in the normal and abnormal conditions. He has tried to tackle this difficult problem more from the point of view of disturbances in the tissue biology rather than pathological alterations characteristic of the different diseases. The book is divided into two parts. In the first part the writer discusses the development of normal bone and dentine from the biological, morpho-biological and biochemical points of view and then tells us about the abnormal conditions which are brought about in rachitis. He observes that the rachitic factor brings about a prolonged course of the differentiation of the bone and dentine cells and also an arrest of growth, these processes acting most strongly where the rate of growth is greatest. In the second part, the process of bone resorption is discussed both in health as well as in abnormal states, *viz*, in experimental hyper-parathyroidism, scurvy, Paget's disease, osteogenesis imperfecta, bone grafting and senile osteoparosis. Throughout the book, the author has tried to explain the real genesis of the normal development of bone and some of its diseases, by a cell mechanism which is influenced by a residual energy and the influence of the medium in which the cell has to act. This is undoubtedly a more rational way of approaching some of the skeletal diseases of doubtful ætiology than a mere study of their pathological picture and the author is to be warmly congratulated for this. We would confidently recommend it to everybody interested in the study of bone and its diseases.

M. N. D.

FOOD TABLES.—By V. H. Mottram, M.A., and E. M. Radloff, B.Sc., Ph.D. Edward Arnold and Company, London. 1937. Pp. 63. Price, 5s.

The last ten years has seen the addition to the practitioner's library of a very large number of books on dietary and food values, but it was still difficult to find a handy and cheap reference book in which one could look up quickly the 'food value' of any particular substance. The book under review supplies this need admirably.

Except for the preface the book consists of one large table. For each substance the values for four different weights are given, namely, 100 grammes, one ounce, four ounces and one pound; this facilitates calculation when one is working out the value of a diet. The values given are for protein, fat, carbohydrate, calcium, phosphorus, iron and calories: there is also a column of additional notes.

The table is a compilation and the sources from which the data are taken appear to be the most reliable.

The book will serve its purpose excellently. The Indian worker should use it in conjunction with *Health Bulletin No.* 23.

DIXON'S MANUAL OF HUMAN OSTEOLOGY.—Revised by E. B. Jamieson, M.D. Second Edition. 1937. Oxford University Press, London, Humphrey Milford. Pp. lx plus 465. Illustrated. Price, 21s. Obtainable from Oxford University Press, Bombay and Calcutta

A separate textbook on osteology is somewhat of a luxury and not many have been published, but this one will be a very welcome luxury to any medical student, and the teacher of anatomy might well look upon it as a necessity.

The information given is considerably more than a mere description of the bones and the attachments of the various soft structures and is by way of being an introduction to the study of anatomy. The figures throughout are excellent and there are some invaluable plates, mostly skiagrams of bones, which show their internal as well as external structure.

It is many years since this book was first published and in the first edition the B. N. A. nomenclature was used, but fortunately for the British student of to-day this nomenclature has been dropped in British schools and replaced by the much more pleasant Birmingham Revision (B. R.) of the B. N. A., and throughout this volume the B. R. nomenclafure is used. It is a book we can recommend to both anatomical and surgical students and to their teachers.

BIOLOGICAL STANDARDIZATION OF THE VITAMINS.—By K. H. Coward, D.Sc. 1938. Baillière, Tindall and Cox, London. Pp. viii plus 227, with 44 figures in the text. Price, 12s. 6d.

Research work on human nutrition in India within the last few years has necessitated the acquisition of quantitative data on the composition of different foodstuffs, particularly as regards the vitamins. Recent diet surveys in this country have shown, for instance, that the appearance of signs of xerophthalmia is associated with a definite range of carotene intakes. Similar data for all the vitamins are clearly required for the prosecution of such investigations, and this volume supplies such a need. Apart from a discussion of the general technique of biological assay, complete details are given on what after all are essential points in this type of work, *viz*, type of animals, distribution of litters, effect of season of year on results, and methods for the mathematical treatment of data. The assays of vitamins A, B, C and D are treated with the international unit taken as the standard. The publication is essential for any laboratory concerned in the analysis of indigenous foods as a basis for diet and nutritional surveys.

H. E. C. W.

BIOLOGICAL AND CLINICAL CHEMISTRY.—By Mathew Steel, Ph.D. 1937. Henry Kimpton, London. Pp. 770. Illustrated. Price, 36s.

The main object of this book is to promote the development of a more intimate relationship between chemistry, physiology and medicine, and the perusal of the book will convince the reader that the labours of the author have been well spent in that direction. The contributions of biochemistry to the progress of medicine, though recognized from very early times, have at no period in the history of medicine been of such paramount value as during the last few years. As a matter of fact it would be no exaggeration to say that applied biochemistry has played a most important part, not only in denuding it of empiricism but, what is more, in raising it to the present state of efficiency.

The present text differs from similar books on the subject in that the author has attempted to blend theoretical and practical biochemistry with chemical pathology and clinico-chemical methods. The experiments described in the text are simple and the student is advised to do the test on himself so that he gets thoroughly acquainted, not only with the different techniques but incidentally begins to get an insight into the 'chemistry of diseases'. Thus, if he analyses his own stomach contents after a test meal, if he analyses his own blood and urine and performs clinico-chemical tests on himself, such as sugar tolerance, urea-clearance tests, etc., he gets a much better idea about such things as the influence of food and drugs on metabolism and is enabled to take a real interest in his experiments.

The idea of the author in making the student more chemistry-minded from the very outset is an excellent one and the perusal of the book in the light the author

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would have it should be a great help to the student in getting a deep insight into the chemistry of diseases.

We gladly recommend the book to every student of medicine.

J. P. B.

PRACTICAL METHODS IN BIOCHEMISTRY.—By F. C. Koch. Second Edition. 1937. Baillière, Tindall and Cox, London. Pp. ix plus 302. Illustrated. Price, 10s.

THIS is an excellent handbook on practical physiological chemistry, intended for students going up for higher studies on the subject. The book has been written in an excellent style and the author has clearly and comprehensively dealt with the fundamental principles before describing the practical experiments.

The book has been divided into 3 parts, part I deals with the chemistry of cell constituents, such as carbohydrates, lipins, proteins, nucleo-proteins, nucleic acids, etc.; part II deals with the chemistry of the digestive tracts, such as salivary, gastric and intestinal digestion, and part III deals with quantitative analysis of blood and urine. In addition, there is a very useful appendix at the end of the book, dealing with such things as general laboratory instructions, special instructions for the use of instruments, such as colorimeters, etc., and detailed instructions for making standard solutions. In the strictly quantitative procedure of blood and urine analysis, only the more accurate of the rapid and practical methods have been given. This will be an advantage to the student who will not thus be confused with numerous other methods of doubtful value.

The revised method of doing the urea-clearance test by the direct Nesslerization method of van Slyke and modified by the author is a useful addition to the present edition.

We are of opinion that the book is a first class laboratory guide for students of biochemistry, and we have no hesitation in recommending it as such.

J. P. B.

MEDICAL BACTERIOLOGY—DESCRIPTIVE AND APPLIED INCLUDING ELEMENTARY HELMINTHOLOGY.—By L. E. H. Whitby, C.V.O., M.A., M.D. (Camb.), F.R.C.P. (Lond.), D.P.H. Third Edition. 1938. J. and A. Churchill Limited, London. Pp. ix plus 372, with 79 illustrations. Price, 11s. 6d.

THE medical curriculum becomes increasingly heavier year by year, but it is difficult to see how it can be pared down. An elementary knowledge of bacteriology is certainly essential to both the physician and the surgeon, but the textbooks on bacteriology on which students of the last generation were nourished have grown alarmingly and have now become handbooks, more suitable for those engaged in the practice of bacteriology or for students taking special courses. The book under review, which though in its third edition is new to the reviewer, would seem to supply the undergraduate student with all he need know about bacteriology and yet not more than he should be capable of assimilating in the hours that he can spare for this subject.

Our praise of the book must be general and our criticism specific; we should therefore like to print the former in bold-face and the latter in minute 4-point type, but the printer will not allow it. For the most part the compression has been done excellently and the really important point, the relationship of the micro-organism to the disease, is given due priority over detailed descriptions of the morphology and cultural properties of bacteria. The introductory chapters are concise, and just sufficient technical details are given to satisfy the needs of the student and the practitioner at the bedside.

On the other hand, the student and practitioner in the tropics have not been quite fairly treated. Rickettsia has been given only a page and a quarter, and this includes a table and a figure; emphasis has been given to the proteus (0.2 to 0.7 c.c.) and only three types of typhus are given—effective remedy of these trench fever, which might well—chloride and omitted, is one. Reference is made to—and have the form of rat-bite fever which is apparently certain to transmitted by rats nor caused by *Spirill*—capsules are Protozoa are of course included—though not in liquid in the title. Why is it that bacteriologists, usually they have the right to pilfer the protozoa—combined apology? Having done so they might at least—ish the them with more respect—'three protozoal—iodide caused by organisms *known as* Leishmaniæ'. We say 'written by a bacteriologist *known as* Dr. Whcause therefore why not 'caused by Leishmaniæ' addin the genus of protozoal parasites', if thought necess. And incidentally the disease caused by *Leishma tropica* is not *known as* 'tropical ulcer', not in th best-informed circles, at any rate, as ulcus tropicum has quite a different ætiology.

Definite favouritism is shown to the helminths, who, despite the fact that they only needed 13 against the protozoas' 14 pages, aspire to titular mention; 'including elementary helminthology' appears on the title page. It is certainly elementary, but still we think that some mention might have been made of how this 'world producer of death, incapacity, and misery' does his nefarious work, and how he obtains his own nourishment. The sentence 'Severe microcytic hypochromic anæmia is common' concludes a paragraph on the anatomical description of the adult worm, and is followed immediately by a description of the ovum. The young student might be forgiven if he were a little confused.

Even the more advanced student might well be shaken by 'nolenthan' on p. 161, which at first we thought might be a patent American milk product but which we decided was merely an interesting misprint—interesting, because it must have come right through from the manuscript stage or from a later manuscript correction.

On the whole, however, the book is a valuable addition to the medical library and is very well suited to the needs of the M. B. student in this country; we strongly recommend it to him and to his teachers. The practitioner also will find it gives him as much of the subject as he will require in his everyday practice.

MEDICAL RESEARCH COUNCIL. SPECIAL REPORT SERIES, NO. 226. MEDICAL USES OF RADIUM: SUMMARY OF REPORTS FROM RESEARCH CENTRES FOR 1936. Published by His Majesty's Stationery Office, London. 1937. Pp. 41. Illustrated. Price, 1s.

'THIS report summarizes the work done with radium and radium emanation during 1936 at some twenty hospitals or other research centres, most of which hold radium on loan from the Medical Research Council; it thus continues the accounts given in the fourteen similar reports which have preceded it. It gives details of laboratory experiments on the fundamental aspects of irradiation and on the biological effects of radium upon cells and tissues, as well as of clinical methods used for the radium treatment of cancer. Statistical data relating to the after-histories of patients treated in earlier years have been included as before, and a new feature of this report is a section dealing with work at two centres on the use of massive radium units (teleradium therapy) for treating cancer'.

MEDICAL RESEARCH COUNCIL. SPECIAL REPORT SERIES, NO. 225. INVESTIGATIONS INTO THE NATURE AND CHARACTERISTIC FEATURES OF POST-NORMAL OCCLUSION.—By M. Young, E. Johnson, C. Smyth and M. Still. Published by His Majesty's Stationery Office, London. 1937. Pp. 93. Illustrated. Price, 1s. 6d.

THIS report will be of considerable interest to dental surgeons and anatomists.

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MARCH, 19?

OF HYGIENE. SHWASTHYA
RITTEN IN BENGALI.—By Radha
Merjee, M.B., D.T.M., D.P.H. 1937.
y Kamala Book Depot Limited (15,
J. W. F. are), Calcutta. Pp. 312. Illustrated.
Major C. 1-8.

Major is a
Major Cr has very successfully undertaken the
is antedat. of getting up a standard textbook on
rank from ygiene in Bengali for students preparing
The matriculation examination of the Calcutta
of Maj. In the attempt to use only vernacular
W. gy for anatomical parts, etc., the introduc-
in th very uncommon synonyms has become inevit-
A. d these 'unusual words' though scientifically
in te are rather difficult for elementary students:
Yet, the exact meaning of many of the terms
in to be referred to an Anglo-vernacular glossary
ished at the end of the book. The book consists of eighteen chapters, namely, introduction, elementary anatomy and physiology, health, exercise and posture, environment, sunlight, air, earth, water, dwelling houses, food, origin and spread of diseases including bacteriology and control of spread of diseases, prevention of diseases, problems of social hygiene, smallpox and cholera, school hygiene, personal hygiene and mental hygiene—each chapter has been dealt with fairly elaborately—perhaps a little too elaborately for a matriculation student for whom hygiene is an optional subject: the information contained in these chapters is in a few instances almost up to the standard of the examination of the State Medical Faculty. A more critical reading and correction of the galley proofs would have obviated the rather confusing printer's mistakes, especially the one on the fourth page of the contents, which reads 'Benefits of narcotics' instead of 'The evil effects of narcotics'.

Abstracts from Reports

THE ROCKEFELLER FOUNDATION, NEW YORK: ANNUAL REPORT, 1936

In giving away 11,300,000 dollars during 1936 in connection with its world-wide programme, the Rockefeller Foundation co-operated financially with 130 agencies, in amounts varying from several thousand to several hundred thousand dollars; made available to scholars engaged in advanced scientific work 222 grants in aid, ranging in amount from a few hundred to a few thousand dollars; provided some 700 fellowships for post-graduate training of young men on whom will fall the burden of future leadership in fields of science, public health, and social welfare; made two large grants for endowment in connection with the closing up of a former programme; and conducted, by means of its own field staff of about seventy public health experts, researches on yellow fever, malaria, hookworm disease, tuberculosis, yaws, diphtheria, schistosomiasis, and influenza.

The agencies aided by the Rockefeller Foundation include 41 local and national governments, 44 educational institutions, such as schools, colleges, and universities, 20 research institutes, 2 libraries, and 23 councils, associations, societies, and commissions, most of them national or international in scope.

Work in 53 foreign countries was included in the foundation's programme of activities. The agencies with which it co-operated financially have a geographical range all the way from Scandinavia to Java. The funds appropriated for projects located in countries other than the United States amounted to 3,621,000 dollars, or about one-third of the total expenditures of the year. The balance was appropriated for projects conducted by organizations within the United States.

THE PURPOSE AND METHOD OF THE FOUNDATION

The purpose of the Rockefeller Foundation, written into its charter in 1913, is 'to promote the well-being of mankind throughout the world'. Changing conditions in scientific and social development must necessarily affect decisions as to how that purpose can best be realized. Nevertheless, for a decade or more, the advance of knowledge, with research as the chief tool, has been the definite objective and method of foundation action. The programme has extended into the fields of natural science, social science, medical science, the humanities, and public health. Except in public health, the foundation is not an operating organization. It conducts no researches of its own. Its efforts are limited to the support of other agencies—universities, laboratories, research institutes—where the promise of results seems particularly bright.

A programme concerned with the advance of knowledge runs the risk of scattering its resources over too wide a field unless a fairly definite policy of concentration is adopted. Consequently, in natural science, the foundation has for several years placed its emphasis largely on experimental biology; in the social sciences, it has been particularly interested in problems relating to social security, international relations, and public administration; its work in the medical sciences has chiefly to do with psychiatry, broadly interpreted; in the humanities, it is working not so much on the content of humanistic studies as on the techniques by which cultural levels are affected, *i.e.*, radio, non-professional drama, museums, libraries, and language problems.

These immediate interpretations of the ultimate objective of the foundation are, of course, subject to adjustment and alteration as conditions dictate. A programme that is too narrowly conceived and perhaps too long maintained can become ineffective and even sterile. There must always be the possibility and the inclination to change the strategy of attack in order to meet human problems that are new and challenging.

'THE PROPER STUDY OF MANKIND . . .'

A foundation that elects to follow a selective programme in enlarging the boundaries of knowledge is confronted with difficult questions. What special branches of knowledge should be enlarged? Is all knowledge equally important? Is anybody wise enough to determine the relative significance of different types of knowledge to a social order struggling for equilibrium?

The debate on these questions is, of course, world-wide. Uneasiness and even alarm are growing as the belief gains ground that the contributions of the physical sciences have outstripped man's capacity to absorb them. As General Smuts pointed out in his presidential address before the British Association for the Advancement of Science, there can be but little question that a serious lag has developed between our rapid scientific advance and our stationary ethical development, a lag which has already found expression in the greatest tragedy of history. A more recent president of the same Association, Sir Josiah Stamp, expressed the idea in these words: 'We are like a contractor who has too many men bringing materials on to the site, and not enough men to erect the buildings with them. . . . We are producing progressively more problems for society than we are solving. . . . Additional financial resources should be applied more to the biological and human sciences than to the applied physical sciences'.

It has been estimated that of all the money spent on research in Great Britain and the United States, one-half of the total goes for industrial research and for the underlying pure research in physics and chemistry. Of the remaining half, 50 per cent is spent on research in connection with military questions. Of the remaining quarter of the total sum, the larger part is devoted to

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research in agriculture and the branches of biology which support it. Further down the list is research in medicine and public health. Finally come the social sciences with an infinitesimal fraction of the total devoted to their development. For research in the humanities the amount is relatively so small as to be scarcely discernible.

It is this consideration, among others, which has led the foundation to sharpen its programme.

Yellow fever.—Based on laboratory technique, a survey of the world by yellow fever immunity in man has been carried on during the past five years by the International Health Division, with the co-operation of the many governments concerned. The surveys of Africa and South America produced evidence of a much wider distribution of yellow fever than had been suspected. Details on the findings in Africa and preliminary data on immunity in South America have been published in previous annual reports of the Rockefeller Foundation. During 1936 there was published in the medical press information obtained in the yellow fever immunity survey of parts of the world other than Africa and South America. These investigations covered as many countries as seemed necessary, to determine the general boundaries between the recently infected and non-infected regions, and to show where intensive local surveys were required.

In addition to this method of obtaining information on the presence of yellow fever, now or in the past, another method has been developed which is based on the fact that yellow fever in man does much damage to the liver. In fatal cases a histopathological examination of the liver alone is frequently sufficient to establish positive or negative diagnosis of yellow fever. For the difficult conditions such as exist in rural areas in Brazil, where medical personnel is often not available to perform an autopsy when a fatal suspect case occurs and thus obtain a full set of tissues for examination, an instrument known as a viscerotome was developed by Yellow Fever Service. With this instrument a small portion of liver can be removed from a cadaver without an autopsy. The specimen thus removed is placed in a fixative and sent to the laboratory for examination. The viscerotome service is now so organized that in all cases in which death was preceded by acute fever a piece of liver tissue is removed by the local official who issues the burial permit. Up to present time over 60,000 liver specimens have been examined at the laboratories in Rio de Janeiro and Bahia.

When specimens showing pathological lesions suggestive of yellow fever are received at the laboratory from localities in rural areas, members of the field staff go into those localities and make a careful study of the conditions prevailing, and of any clinical cases that may occur there. If any of the persons examined show symptoms resembling those of yellow fever, blood is taken for intracerebral inoculation into mice for the purpose of isolating the virus. In addition, specimens of blood are taken from persons who have recently recovered from attacks of illness of a suspicious nature, and their sera are tested for yellow fever immunity.

It was by these procedures that frank cases of yellow fever were found and strains of virus isolated in rural areas where the inhabitants lived in widely scattered farm-houses with little communication among them, and where there were no stegomyia mosquitoes, and even no mosquitoes of any kind. In other words, it was shown that yellow fever exists in the South American jungles, with an epidemiology that does not fit in with our past knowledge of the disease, which was based on information and data obtained in cities and densely populated areas. This has opened up a very broad and immensely difficult problem for study and it may be some time before there is full clarity in the picture of the so-called jungle yellow fever.

Yellow fever vaccination.—The vaccination of persons against yellow fever by the staff of the laboratories of the International Health Division began in 1931 and has progressed in three stages. The first, which lasted from May 1931 to January 1935, and employed the technique described above, accomplished its immediate purpose of preventing further cases ctive remedy (0.2 to 0.7 c.c.) among investigators. It was not practchloride and scale use in yellow fever control on nd have the difficulty in obtaining and administerings certain to amount of immune serum. Research apsules are persistently directed toward the productic in liquid of yellow fever virus that could be used s: usually immune serum. As a result, the second or combined stage was reached in March 1935, when a beish the made in vaccinating persons with a virus stra: iodide by prolonged propagation in tissue culture. was still not sufficiently low in virulence to pcause use without immune serum. The threshold of t the stage has now been reached through further m tion of virus strains by cultivation in tissue essentially time-consuming procedure. On November, 1936, it became possible to use a modn virus strain of exceedingly low virulence, without pre ously injecting immune serum. It is hoped that th will make it feasible to apply active immunization to a much greater number of persons than was heretofore possible.

The nature of viruses.—The group of infectious agents known as the filtrable viruses has aroused much interest in recent years. A great deal is known regarding their harmful effect upon a susceptible host, whether plant, animal, or man. Nothing is known, however, of their exact nature. A fundamental study of the physical nature of viruses is exceedingly difficult. They do not exist in nature in a pure and concentrated form but are always associated with a large amount of protein matter originating from the host which they attack. They are strictly parasitic and propagate only upon living cells. Separation of viruses from the protein with which they are associated is very difficult, as most viruses are labile and easily inactivated by the chemical processes involved in such separation. No chemical or physical test is known by which the presence of a virus in a given material can be detected except by its specific action on a susceptible host.

During the past three years much time has been spent also in developing high speed centrifuges which could be used with advantage in the study of viruses.

The rotating part of the instrument is provided with a transparent quartz cell in which the sedimentation velocity of the material studied is recorded photographically while the centrifuge is running. The centrifuge has been run repeatedly at a speed of 60,000 revolutions a minute, and a centrifugal force of 260,000 times gravity has been obtained in the cell. It is hoped that this ultra-centrifuge will be an important tool for research, not only in the study of viruses but also in protein chemistry in general.

Some progress was made during the year in devising chemical procedures for the separation of the yellow fever virus from the associated protein without inactivating the virus itself. Virus-containing materials such as blood or tissues from infected animals were dessicated in the frozen state, fat was extracted by ether or petroleum ether, and separation of the various protein constituents from the virus was accomplished by fractional precipitation with saturated solutions of different salts. After most of the proteins were removed, the virus suspension was rendered salt-free by quick dialysis. The results indicate that yellow fever virus, although extremely labile under ordinary conditions, is relatively stable when kept in an anhydrous condition such as obtains in ether mixtures or saturated salt solutions. The final product, which shows only traces of protein by ordinary chemical tests, has lost a relatively small portion of active virus during the process. In its final stage it is highly diluted, but can be easily concentrated in the high speed vacuum centrifuge mentioned above.

Influenza.—Influenza studies which had been carried on during the two previous years by the Rockefeller Institute for Medical Research were taken over by the International Health Division of the Rockefeller Foundation at the beginning of 1936. Four members of the International Health Division staff devoted their entire time to these studies. A number of fundamental problems, chiefly relating to the characteristics of the

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influenza, were investigated during

Mo—A broad epidemiological study of
J. W. F. A as initiated during 1936 in Roumania,
Major C. ns are favourable for the study of this
Major is an est centres upon factors producing epi-
Major C ods of spread, and development of control
is antedat
rank from ws might conceivably be controlled in one
The pri ways. Susceptible individuals might be
of Majo . At present there is no vaccine against
W. F. d. Secondly, transmission might be interrupted.
in tha as been some indication that a small fly called
A. tes pallipes might have something to do with
in t transmission. Such transmission in nature has not
P proved. But even if these flies did mechanically
in mit the disease, and if they could be controlled,
disease would still also be transmitted by contact.
he third way in which yaws might be controlled is
by treatment, and this is the method used in the yaws
campaign in Jamaica with which the foundation has
been associated. By a comparatively simple form of
treatment the individual can be rendered non-infectious.
Such treatment relieves suffering and cuts down the
source of infection.

Syphilis.—The foundation has been co-operating with the Johns Hopkins University School of Hygiene and Public Health in the development of a health district in the city of Baltimore. The district serves as a practice field for students in public health. The school has undertaken epidemiological studies of syphilis in this area, and the foundation has assigned a staff member to assist in the investigations. Further aspects of the work include laboratory studies and the teaching of syphilis control to public health students.

Schistosomiasis.—For some years the foundation has co-operated with the Egyptian Government in studies aiming at the control of schistosomiasis, a disease caused by the liver fluke, and a serious public health problem in Egypt. This work was continued in 1936. The organism which caused the disease is carried by snails frequenting the numerous canals used in irrigation. Much research has been done on the life cycles of these snails for the purpose of arriving at a practical method of attacking the disease. To determine the effectiveness of canal clearance as a control measure alternate canals were cleared of weeds, plant refuse, snails, and ooze at two-month intervals, and others were left undisturbed for comparison. Surveys were made before clearance, during clearance, and after clearance, and snail reduction was found to be significant and gratifying. Clearance of canals is therefore proposed as a prime factor in any scheme for the control of human schistosomiasis in Egypt. It is efficient and inexpensive, and can be done satisfactorily by the ordinary workman.

Smallpox vaccine.—The foundation has co-operated with the Tennessee State Health Department, and with the Department of Pathology of Vanderbilt University, in research on the preparation of smallpox vaccine virus in embryo chicks within the egg. Attention is centered on the large-scale production of the new embryo chick smallpox vaccine.

Hookworm disease.—The only country in which the foundation is at present still co-operating directly in the control of hookworm disease is Egypt, where studies in the improvement of sanitation, especially by means of the bored-hole latrine, were continued during 1936.

Malaria.—By far the major part of the foundation's work in malaria concerns research and control efforts carried out in co-operation with communal and governmental authorities in many parts of the world.

In the work in Italy an attempt has been made to solve the engrossing problem encountered not only in that country, but in many parts of Europe, of anophelines without malaria. Studies indicated that the anopheline mosquitoes in non-malarious areas had little or no contact with man. This was determined by examining the blood taken from thousands of mosquito stomachs and identifying the species of animal from which the blood had been drawn. This led to the hypothesis that the anophelines in these places had a preference for animal blood, and that there were probably two biological races of *Anopheles maculipennis*, one a man biter, and the other predominantly a cattle feeder. In the absence of any physical difference between these two types, the theory found little acceptance. A search was instituted for an identification mark between these different races of *Anopheles maculipennis*. Finally the solution appeared where it was least expected, namely, in the complicated and varied patterns of the mosquito eggs. Certain patterns of eggs were always missing in malaria-free areas. It turned out that these missing egg patterns belonged to the man biters, and the *Maculipennis* mosquito of Europe was not a homologous species, but divided into seven or more races of subspecies, all looking precisely alike, but laying different kinds of eggs. This clarified the whole malaria picture, both in Italy and in other European countries.

These diverse races of *Anopheles maculipennis* choose different types of surface water in which to lay their eggs. Some prefer marshes, some rivers, and some brackish water along the coast. It became possible to sharpen the attack on malaria by directing it against the dangerous forms of mosquitoes, ignoring the others entirely. The new light thrown on the subject of mosquito classification, therefore, led to important practical results. Recent investigations in many parts of the world show that the same condition holds for other widespread anopheles species that carry malaria; that is, certain species other than *Anopheles maculipennis* may also not be homologous, but may consist of different races with different life habits, all of which must be studied to make the attack on malaria more efficacious.

The Madras Presidency in India has been chosen as a suitable locality for malaria investigations in the East. Headquarters have been established at the King Institute of Preventive Medicine in Guindy, which is seven miles south of Madras City. Laboratory investigations of simian malaria have been undertaken, and field work includes anopheline studies and a survey of the many wells in this area, which would come under consideration as mosquito breeding places in any campaign for malaria control.

[This abstract only briefly touches on some of the work of importance in the control of human disease, namely, that of the International Health Division of the Foundation. When it is stated that the report, excluding the financial statements, covers 332 pages our readers will understand that a full abstract is impossible so we are reluctantly compelled to ignore the other branches of its activities.]

ADMINISTRATION REPORT OF THE DIRECTOR OF MEDICAL AND SANITARY SERVICES, CEYLON, FOR 1936

Public health and general epidemiology

Western Province.—The recovery of the Western Province from the effects of the recent malaria epidemic has been, on the whole, very satisfactory. In Kulutara district the incidence of malaria has been normal since April. In Colombo district, during the latter half of the year, conditions closely approximated to normal. The improvement was least manifest in Negombo district where there was a moderate rise in the incidence in January and again in June and July.

Central Province.—In Kandy district, with the exception of Tumpane and Pata Dumbara, the incidence of malaria was practically normal. The almost complete disappearance of malaria from the hilly districts of Nawalapitiya and Watawala, which were more or less severely affected during the epidemic, is remarkable. In Nuwara Eliya district malaria was restricted to the lowlands of Walapane, where it has always been epidemic; the revenue divisions of Kotmale and Uda Hewaheta are now free save a few low-lying villages where a certain amount of malaria still persists. Except for a few localized outbreaks in North Matale and East Matale, where malaria is endemic, the malaria situation in this district showed steady improvement during the course of the year, and the recovery from

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the effects of the epidemic was very marked especially in South Matale.

Southern Province.—In Galle district, the dispensary attendances, speaking generally, were rather higher than usual, but there were no outbreaks of disease. The incidence of malaria in the district was too low to seriously affect morbidity. During the second and third quarters of the year, the Wellaboda and Kandaboda pattus of the Matara district were in the grip of a severe outbreak of malaria. The peak was reached during the week ending 11th July. Owing to the prompt action taken by the department and the provision of ample facilities for quinine distribution, the mortality rate was negligible. Normal conditions prevailed during October and November but in December a second wave occurred which synchronized with the north-east monsoon fever season. In Hambantota district, although no actual outbreaks of malaria occurred during the year, the general health of the population was much less satisfactory than usual. The greater part of this area is hyperendemic and malaria was directly responsible for 75 per cent of the total morbidity.

North-Western Province.—In Kurunegala and Chilaw districts the recovery from epidemic conditions had been tardy. At the beginning of the year malaria was responsible for nearly 70 per cent of the total morbidity but at the end of the year for only 50 per cent. In Puttalam district the conditions were practically normal until the end of October; but during the fever season (November and December) the incidence was high. The dispensary attendances rose to nearly twice and in some places as much as three times the 'expected' for this part of the year.

Northern Province.—Jaffna district experienced an unhealthy year. In January, February, and December, which are usually the most unhealthy months, the outdoor dispensary attendances were twice the normal, but malaria did not occur anywhere in epidemic form. During the fever season malaria constitutes about 60 per cent of the total morbidity, but during the rest of the year it is responsible for only about 20 per cent. In Mullaittivu district severe malaria prevailed till the end of May. Thereafter normal conditions prevailed until the onset of the fever season in November. Mannar district experienced, on the whole, a healthy year.

North-Central Province.—In this province malaria as usual was the predominant disease and was responsible for over 60 per cent of the total attendances. The year was throughout unhealthy but the worst months were January, February, March, and December.

Province of Sabaragamuwa.—In Kegalla district, the recovery from epidemic conditions was very satisfactory. Towards the end of the year the malaria situation closely approximated to normal. In Ratnapura district conditions were normal.

Province of Uva.—In this province malaria was responsible for about 20 per cent of the total morbidity. There were no outbreaks. The hilly districts that were moderately affected during the epidemic are now free from malaria. The increase in the number of cases treated in hospitals and dispensaries was due to causes other than malaria, mostly influenza.

Eastern Province.—In this province as usual malaria was the most prevalent disease. During the first six months malaria prevailed to a much greater extent than usual. The conditions closely approximated to normal in August, September, and October; but with the onset of north-east monsoon rains, there was a moderate rise in the incidence.

The most prevalent general diseases of hospital in-patients were rheumatism, intestinal disorders (diarrhœa and enteritis), bronchitis, and pneumonia. Year by year the number of patients who seek hospital treatment for cancer is increasing.

Plague.—The 57 cases of plague in 1936 show an increased incidence of the disease compared with the average for the previous five years (56). Of these, 45 cases were of the bubonic variety and 12 septicæmic.

Cholera.—There have been during 1936 49 cases with 44 deaths giving a fatality rate of 89.8 per cent. The cases were all confined to the Eastern [illegible] (0.2 to 0.7 c.c.) of 49 cases occurred in Batticoloa dist[illegible]ctive remedy occurred in Trincomalee district. T[illegible]pochloride and outbreaks—the first occurred in March[illegible]nd have the second in October 1936. Forty-five cases [illegible]gs certain to occurred in the first outbreak and 4 fatal [illegible]apsules are in the second. [illegible] in liquid [illegible] usually

The first outbreak occurred at Manmun[illegible] combined the vicinity of Kokkodicholai and Atuc[illegible]gaish the disease first broke out among cultivators wi[illegible] iodide the paddy fields in Manmunai South fo[illegible] harvest. The first case occurred on 17th Mar[illegible]cause and proved fatal on the same day. The la[illegible] the occurred on 17th April, 1936, and the last death [illegible] April, 1936. The second outbreak occurred in [illegible] munai South and Porativu six months after the [illegible] outbreak. The disease broke out among cultivator[illegible] Natpathuwaddai near Atuchenai. The first [illegible] occurred on 6th October, 1936, and the last on 12[illegible] October, 1936.

The exact source of infection could not be definitely traced. In the first outbreak there is reason to believe that the infection had arrived from India from where labourers come periodically for work during harvesting seasons. The source of infection in the second outbreak which occurred almost exactly at the same spot as the first is probably a carrier in the locality. The mode of transmission in both outbreaks is considered to have been by contact. No common source of water supply could be incriminated.

Smallpox.—There were three cases of smallpox, all of which proved fatal. These cases occurred in Colombo in three Indian Tamils who arrived freshly from India. The first case was in a person who arrived in Colombo on 9th January, 1936, and fell ill on 11th January, 1936, and died on 22nd January, 1936. The second was in a person who arrived on 1st August, 1936, fell ill on the same day, and died on 13th August, 1936. The third was in a person who arrived on 30th September, 1936, fell ill on the same day, and died on 10th October, 1936.

Chickenpox.—Six thousand seven hundred and sixty cases as compared with 5,266 cases in 1935 were reported to the sanitary branch during the year with 12 deaths, giving a fatality rate of 0.18 per cent.

Diphtheria.—One hundred and three cases as compared with 116 cases in 1935 were reported to the sanitary branch during the year with 13 deaths, giving a fatality rate of 12.62 per cent. All the cases were of the faucial variety. On an average 9 cases were reported monthly, with the maximum 14 in May and the minimum 5 in March.

Measles.—Two thousand seven hundred and seventy-five cases as compared with 719 in 1935 were reported to the sanitary branch during the year with 2 deaths, giving a fatality rate of 0.07 per cent.

Mumps.—One thousand one hundred and thirty-five cases as compared with 485 in 1935 were reported with 5 deaths. On an average 94 cases were reported monthly, with the maximum 142 in November and the minimum 64 in December.

Whooping cough.—Two hundred and ninety-six cases as compared with 235 cases in 1935 were reported with 21 deaths, giving a fatality rate of 7.09 per cent. The incidence shows a rise in the months of November and December. On an average 25 cases were reported monthly, with the maximum 68 in December and minimum 7 in February.

Enteric.—The actual prevalence of the disease cannot be judged from hospital admissions since many cases resort to ayurvedic treatment and the majority probably are not notified. The number of registered deaths does not indicate the actual mortality from this disease, as some deaths from enteric are undoubtedly included amongst those reported as due to pyrexia. There were 14,520 deaths due to pyrexia in 1936, as against 22,507 in 1935.

Two thousand five hundred and three cases were notified in 1936 to the sanitary branch of this department as compared with 1,991 in 1935, with 449 deaths, giving a fatality rate of 17.8 per cent.

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ee thousand three hundred and thirty-
Maj per cent of the total number of cases
J. W. F. Ab amœbic and 1,067 cases or 20.6 per
Major C. These figures, however, are not of great
Major is an distinction was often made on clinical
Major Cy a small percentage of the cases were
is antedate complete laboratory investigation and
rank from the bacillary type greatly preponderated.
The prty rates of amœbic dysentery were 11.7 per
of Majcf bacillary 10.7 per cent.

W. *Filosis of the lungs.*—Four special institutions—
in thai-tuberculosis institute, Colombo (out-door),
A. a Sanatorium, Western Province, and the
in tsanturai Sanatorium, Northern Province, for early
P and the Ragama Tuberculosis Hospital, Western
in nce, for moderately advanced cases—are main-
ed to deal with this disease.

Leprosy.—During the year 1,253 cases with 74 deaths,
s against 1,261 cases with 97 deaths in 1935, were
treated at Government hospitals including the two
asylums which are maintained in the island for the
segregation of lepers.

Yaws.—Owing to the decrease in the number of cases
the itinerating medical officers who numbered 13 in 1930
were further reduced from 4 to 2 from 1933.

Hygiene and sanitation

Public health work made steady progress during the year, the latter part of which saw the launching of the malaria control and health scheme. This scheme has for its object the carrying out of health work on health unit lines, with special attention paid to malaria, which is made an integral part of general health work. The programme is to take up the whole of the island progressively, and when the work is fully organized and functioning it will no doubt have a marked effect on the improvement of the health of the people.

General sanitation continues to be satisfactory in urban and rural areas. The carrying out of work by co-operation through health leagues has become the policy of the department and good progress has been made.

The control of soil pollution through construction, maintenance, and the use of sanitary latrines is the chief work of sanitary assistants. The progress of this work is dependent on the provision of cement concrete squatting plates which are the only type of platform that is recognized. During the year 347 bucket latrines in urban areas, 13,639 deep pit latrines, 312 bored-hole latrines, and 263 mound latrines in rural areas were constructed, making a total of 17,901 latrines as compared with 9,562 latrines during 1935.

The provision of protected water supplies in urban and rural areas is a matter that needs most attention. Although the matter is before those concerned with their provision, still a large portion of the population lacks a wholesome supply of good drinking water. During the year 119 new public wells were constructed, as compared with 155 in 1935; and 1,667 wells were improved as compared with 1,569 in 1935.

The control of communicable diseases continues to receive close attention. With plague endemic in Colombo, infection from there is carried from time to time to towns in the interior of the island. During the year there were outbreaks of the disease at Anuradhapura and Hatton due to infection conveyed there in bags of rice. Anuradhapura, although a town in the low-country, has had the misfortune in harbouring the cheopis flea, in consequence of which plague was produced. Hatton is a town up-country where the cheopis is prevalent. Infection from Hatton also spread to Maskeliya. The enforcement of the anti-plague regulations is receiving more attention on the part of those concerned and towns are beginning to provide grain stores and approved rice bins for the storage of rice in addition to the enforcement of other requirements. The introduction of fresh infection from outside into Colombo is being dealt with by cyanide fumigation in barges of all grain and other merchandise liable to convey infection from plague-infected ports. The work commenced in September and is being efficiently carried out.

Diphtheria appears to be on the increase and a study is being made of its incidence.

Maternity and child welfare work continues to receive popular support. The number of centres at which work is carried out on approved lines, the number of clinics held and attendance at them, show a steady increase. The work was carried out at 77 centres, 4,543 clinics were held with a total attendance of 17,393 expectant mothers, 29,563 infants, and 18,611 pre-school children. The demand for more work cannot be adequately met for want of sufficient number of public health nurses. The conduct of this work in health units is beginning to show encouraging results in the diminution of infant maternal mortality.

School health work was carried out during the year with the full available staff. Two more medical officers were appointed during the year for school health work for the Panadure Totamune Health Unit and Matara Gravets and Wellaboda Pattu Health Unit. An additional trained public health nurse was appointed to the school medical officer of Galle. During the year 52,629 school children were medically examined, 73,757 defects were found in them and 21,979 were corrected. Provision has been made for dental treatment by nurses available to areas outside Colombo. The interest shown in school health education continues to be maintained through the initiative of medical officers of health and school medical officers. A special syllabus on health education, including practical work, was provided for teachers in training schools, the training of whom is undertaken by school medical officers and medical officers of health. The education department has undertaken the giving of a mid-day meal in schools in certain necessitous areas out of funds provided by the State Council.

The hookworm campaign made satisfactory progress during the year. Six additional qualified apothecaries were appointed as hookworm dispensers, in accordance with the policy to employ trained apothecaries in the place of hookworm dispensers. During the year a total of 1,885,572 treatments were given, as compared with 1,401,962 in 1935.

The leprosy survey has completed the Eastern, Western, and Southern Provinces and work has been organized in them.

Health work under Urban District Councils is carried out satisfactorily. Two of them continued to employ part-time private practitioners as their medical officers of health. The two Urban District Councils which had no medical officers of health at all have come into the scheme of health unit work which is in operation in the area surrounding the town. There is a tendency in one or two other Urban District Council areas to utilize the services of the medical officer of health in a purely advisory capacity in spite of the executive authority he has been granted by the Urban District Councils concerned. This is neither satisfactory nor in the interests of the areas concerned.

Health Unit work which is in operation in 11 areas has functioned satisfactorily. From its adoption for the malaria control scheme it is clear that the health unit type of work has received its well merited recognition.

ABSTRACT OF THE ANNUAL REPORT FOR 1935 OF THE PUBLIC HEALTH COMMISSIONER WITH THE GOVERNMENT OF INDIA

INTRODUCTION

IN the general remarks in section I, the estimated population of India on 30th June, 1935, is given as 278,199,545. Births for the year totalled 9,698,794 and the deaths recorded came to 6,578,711.

The Public Health Commissioner states that the year under review was, if anything, less unhealthy than usual. This view is supported by the facts that the recorded births numbered 410,000 more than those of 1934, and the total deaths were less by 288,000.

There was a decrease of 24,000 in the total mortality from the three principal epidemic diseases—cholera, plague and smallpox. This decrease is largely accounted for by the reduction in plague deaths which fell from

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80,000 in 1934 to 32,000 in 1935. The cholera mortality curve which has been rising since 1933 continued to rise during 1935, but the indications are that the present cholera wave has now passed its peak. There was an increase of 7,000 deaths in smallpox.

The report points out that regrettable though the extent of these major epidemics may be, there are still other diseases which cause much greater havoc although perhaps in a less dramatic way. Malaria, tuberculosis, leprosy, infant mortality and maternal mortality constitute grave dangers to public health. In all these five groups there exists a common predisposing ætiological factor which is of vital importance. This predisposing factor is nutrition. Its importance is stressed in the following terms:—

'No preventive campaign against malaria, against tuberculosis or against leprosy, no maternity relief or child welfare activities are likely to achieve any great success unless those responsible recognize the vital importance of this factor of defective nutrition and from the very start give it their most serious attention. Abundant supplies of quinine and the multiplication of tuberculosis hospitals, sanatoria, leprosy colonies and maternity and child welfare centres are no doubt desirable, if not essential, but none of these go to the root of the matter. The first essentials for the prevention of disease are a higher standard of health, a better physique and a greater power of resistance to infection. These can only be attained if the food of the people is such as will give all the physiological and nutritional requirements of the human frame. This question is obviously closely correlated with that of population and with the planning of sufficient and suitable food supplies. The question of numbers is the subject of later comment; that of food supplies is one of primary concern to the central and provincial agricultural departments and they may be expected to utilize available information on nutritional needs in planning food crops and food production. To obtain the best results, a close liaison must be maintained between the human nutritional research workers and those who can bring influence to bear on the food producer. Only when that liaison has been able to effect the quantitative and qualitative improvements in food supplies which research has shown to be so urgently necessary, will it be possible to anticipate any great or permanent reduction in the incidence of those diseases which at present take such a pitiful toll of human life in this country'.

Population

The section devoted to population contains some startling figures. Apparently, at no period in the recorded history of Indian vital statistics has the natural increase of population maintained such a high level as in recent years and, in British India alone up to the middle of 1935, approximately 15 millions were added to the population since the last census was taken in 1931. Assuming that the same rate of increase has occurred in the Indian States, the population in India as a whole is stated to have increased since 1931 by 5 per cent bringing the total estimated number to well over 370 millions. The Professor of Vital Statistics and Epidemiology in the All-India Institute of Hygiene and Public Health, Calcutta, has recently published a paper entitled 'A Forecast of Population in India at the Census of 1941'. This forecast deals with a date only six years ahead so that it avoids the errors of a long term prediction. The birth rate in British India has been fairly steady from the beginning of the present century but the death rate has tended to decrease from 1921 onwards. Specific mortality rates were worked out for both males and females for the period 1921 to 1933, using estimated populations for each year, and it was found that the trend of mortality was downwards for all age groups except that of '60 years and upwards' in the case of both sexes. The conclusion drawn is that the fall in mortality recorded in recent years is real and that the death rate is unlikely to show an upward trend, at least in the near future. That being so, the application of further statistical analysis was justified and by two separate processes figures of approximately 402 and 400 millions respectively were obtained for the estimated population of India as a whole in 1941. It is stated, therefore, that the next five years may be expected to have the least abnormal epidemic or famine conditions. It is certain to be that the population of India in 1941 is likely to approximate

Infantile mortality

The infantile mortality rate has shown a steady downward trend during the past twenty years. Although some considerable reductions have been recorded in certain provinces in 1935, the report emphasizes that the infant death rates remain high. India are still pitifully high. A helpful analysis of the deaths under one year and it transpires that 40 per cent of these occurred in the first month and 61 per cent occurred in the first week. Of the total deaths in India 43 per cent were among children under five years of age. The figures go to show the extreme necessity of developing in India an organization which will care for the health of the children and the mothers. An attempt has been made in recent years in Bombay city accurately to diagnose the different causes of infantile mortality. Debility and respiratory diseases account for 76 per cent of these deaths.

Principal diseases

Section II of the report gives an account of the principal diseases affecting India. The only figures available for these diseases are those of recorded deaths which are admittedly defective. While in such circumstances it is ordinarily unsafe to make definite inferences from the statistics of any one year, the report nevertheless asserts that, on the assumption that the percentage of error is fairly constant, statistics over a period of years may reasonably be expected to give not unduly distorted epidemiological pictures. Under the varied headings of 'Fevers' a death rate of 14 per mille was recorded. Similarly, the uninformative title of 'Other Causes' accounts for a death rate as high as six per mille. The importance of more accurate information does not require to be stressed. Even a partial exposition of the omnibus groups would almost certainly reveal problems demanding urgent attention. For example, such analyses would give public health departments much needed information on the real incidence of diseases such as pulmonary tuberculosis and enteric fever. In the absence of such epidemiological facts, the health officer is severely handicapped in his efforts to apply preventive methods. Until a general effort in these directions is practised, the epidemiologist using existing statistics may be accused with some degree of truth of mere speculation.

Cholera

In most of the provinces in which cholera was prevalent in 1935, its spread is ascribed in a majority of cases to the holding of fairs or festivals. The belated reporting of outbreaks facilitates the extension of the disease. The application of preventive methods lies entirely in the hands of the local authorities, and it is rightly emphasized that until district boards and municipal councils provide themselves with qualified health officers and adequate health staff, and until these bodies are prepared to spend money on efficient water supplies and sanitation, any campaign devised against cholera will almost inevitably prove abortive.

In the year under review, exceptionally severe epidemics of cholera prevailed in the provinces of Bihar and Orissa, Bengal, Central Provinces, Madras and Burma. Routine sanitary measures such as disinfection of water supplies, improved conservancy, inspection of pilgrims, etc., were carried out with varying degrees of efficiency. Inoculation with cholera vaccine is once more stated to be the most effective method of personal prophylaxis. Bacteriophage was tried in Assam, but the results are stated to have been inconclusive. It was also used in Bihar and Orissa. In Madras Presidency, its use was discontinued as the results obtained were not encouraging.

Plague

It is heartening to read that plague does not now present the serious problem which it did in the earlier

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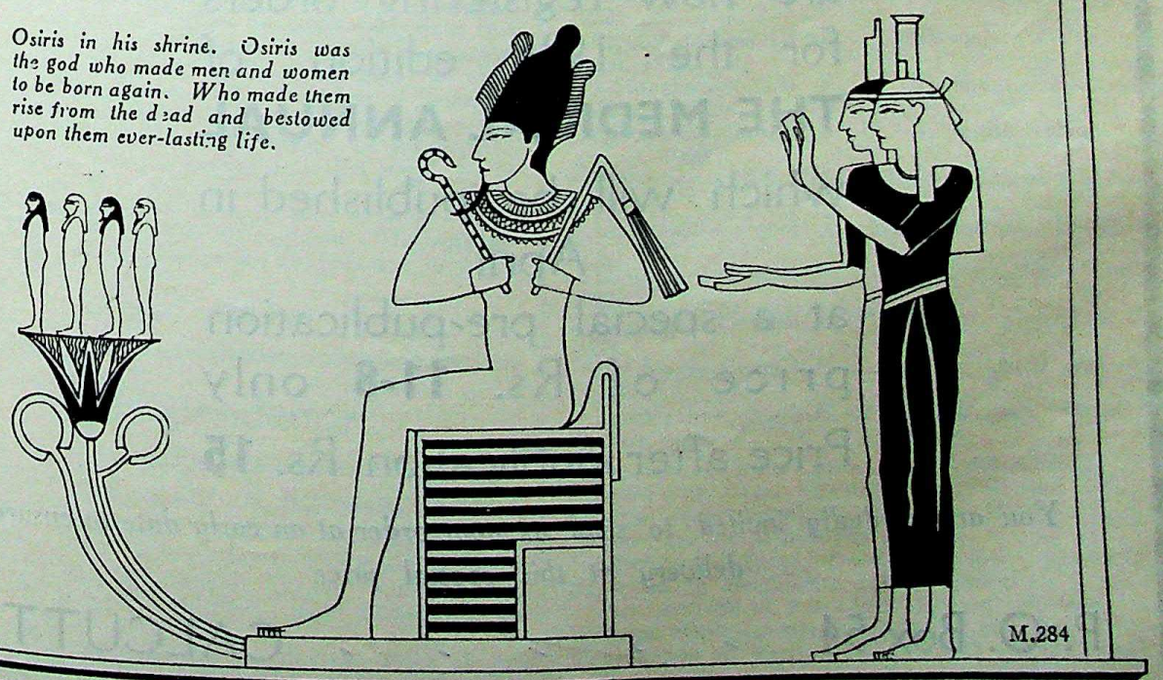

Osiris in his shrine. Osiris was the god who made men and women to be born again. Who made them rise from the dead and bestowed upon them ever-lasting life.

M.284

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demic which has prevailed since 1896. of some severity still occur and in *Majo*:d areas the disease occurs in endemic J. W. F. All es given in the report indicate that up Major C. Vie took an annual toll of half a million Major is ant en the years 1931 to 1934, this annual death Major C. pped to 50,000, and in the year 1935 plague is antedated pped to 32,000. This improvement cannot rank from ed, at least in rural areas, to any permanent The pr ent in sanitary standards, and the suggestion of Major rward that the lesser incidence of the disease W. F may be the result of an increased immunity in that disease amongst the rats. Field research in anti- A. P measures was carried out in the Cumbum Valley in th adras Presidency and the results illustrate the B fe of fumigation of rat burrows by means of in nogas.

SMALLPOX

Deaths from smallpox rose to 280,881 as against 261,242 in 1934. This is all the more regrettable since, of all the major epidemic diseases, smallpox can be most easily prevented by the practice of vaccination. Each year eight to ten million persons submit to primary vaccination. An additional twelve to fifteen millions are revaccinated and many thousands acquire a natural immunity through an attack of smallpox. These three groups give the total number of persons protected each year, but when compared with the total population they comprise a small percentage only. There seems to be no doubt that vaccination in India can only be described as unsatisfactory. In many of the provinces, the health organizations are defective and the supervision of vaccinators, particularly in rural areas, is either non-existent or is performed in a perfunctory manner. For the same reason, outbreaks of the disease are not promptly reported to the health authorities and infection becomes widespread before necessary preventive action can be taken. Where satisfactory health organizations exist, satisfactory results have generally been obtained. Of the total deaths, fifty per cent were among children under ten years of age. In this connection the report points out the desirability of employing female vaccinators for vaccination work among women and children.

Of the 9,698,794 registered infants only 45 per cent were successfully vaccinated, and the report points out that this low percentage gives a clear indication of the generally backward state of protection in this country. The figures for vaccination staffs in the various provinces give the impression that the personnel employed is insufficient. More unsatisfactory than this, however, is the fact that the work of the vaccinators employed is inadequately supervised. This is clear from the opinions expressed by a number of Directors of Public Health that the average number of vaccinations performed by the vaccinators is inadequate. Obviously, supervision is lacking and this seems to be especially the case in rural areas.

Revaccination amongst women who observe strict purdah is stated to be a difficult problem. The employment of women vaccinators is the obvious way in which to remedy this.

(*To be continued.*)

Correspondence

GREASING THE SCALP IN HYPERPYREXIA

To the Editor, *The Indian Medical Gazette*

SIR,—The queries by a reader in the *Practitioner* of August 1937, and the answer by the editor about 'greasing the scalp in hay fever', have induced me to write this letter.

Greasing the scalp with ghee and the soles of the feet and palms of the hands with butter and oil is part of a routine domestic treatment among Indians for a headache in hyperpyrexia.

For greasing the scalp, generally ghee or oil only is used, and is rubbed in continuously for about 20 minutes. For greasing the palms of the hands and soles of the feet, ghee, butter, or oil may be used. These substances are rubbed with the aid of a *kansa vatka*, a zinc utensil, until the grease is of a dark colour and is now called *kal*.

In the absence of knowledge about its rational action, it is not possible to say much about it, but to speak empirically it is quite certain that it is most efficacious in allaying a headache and the burning sensation of the hands and feet, and it relieves the patient of his discomfort to a great extent. This, I think, might be due to excretion of lactic acid produced in excess by muscular fatigue.—your, etc.,

SHANKERPRASAD K. SHUKLA,
Medical Officer.

BABRA DISPENSARY,
W. I. S. AGENCY
(KATHIAWAR).
21*st October*, 1937.

Service Notes

APPOINTMENTS AND TRANSFERS

The undermentioned are appointed Hon. Surgeons to the King

Colonel S. G. S. Haughton, C.I.E., O.B.E. Dated 10th August, 1937, *vice* Major-General E. A. Walker, C.B., retired.

Colonel N. M. Wilson, O.B.E. Dated 16th September, 1937, *vice* Major-General Sir Frank P. O'Connor, *Kt.*, D.S.O., retired.

The dates of the appointment of the undermentioned officers to the Civil Branch of the Indian Medical Service are shown against their names :—

Major-General H. C. Buckley. Dated 20th April, 1920.

Colonel J. Taylor. Dated 4th October, 1913.

Lieutenant-Colonel R. E. Wright. Dated 14th February, 1914.

Lieutenant-Colonel A. N. Palit. Dated 24th October, 1922.

Lieutenant-Colonel K. G. Pandalai. Dated 24th April, 1922.

Lieutenant-Colonel F. R. Thornton. Dated 18th February, 1925.

Lieutenant-Colonel E. C. A. Smith. Dated 8th August, 1929.

Lieutenant-Colonel O. R. Unger. Dated 9th March, 1937.

Lieutenant-Colonel R. M. Kharegat. Dated 28th July, 1927.

Lieutenant-Colonel D. Clyde. Dated 13th February, 1924.

Lieutenant-Colonel R. C. Clifford. Dated 1st July, 1930.

Lieutenant-Colonel R. L. Vance. Dated 29th April, 1931.

Lieutenant-Colonel H. Williamson, O.B.E. Dated 28th August, 1932.

On return from leave Lieutenant-Colonel C. J. Lodge-Patch, M.C., resumed charge of the office of Medical Superintendent, Punjab Mental Hospital, Lahore, on the 27th January, 1938.

Lieutenant-Colonel J. R. Kochhar appointed as Specialist in Radiology, Lahore District.

The services of Lieutenant-Colonel B. Gale, Civil Surgeon, Simla-E., were replaced at the disposal of the Government of Punjab. Dated 29th October, 1937.

On return from leave Lieutenant-Colonel P. D. Chopra assumed charge of the office of Superintendent, New Central Jail, Multan, on the 11th January, 1938.

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The undermentioned officers are reverted to Military duty.

Lieutenant-Colonel C. S. V. Ramanan on 6th November, 1937.

Lieutenant-Colonel R. A. Logan, on 21st November, 1937.

Lieutenant-Colonel R. L. Vance, on 12th November, 1937.

Major H. M. Strickland, on 10th November, 1937.

The following officers have been appointed to the Civil Branch of the I. M. S. with effect from the 1st April, 1937, with seniority from the dates noted against each :—

Major D. P. Lambert. Dated 13th June, 1934.
Major E. S. S. Lucas. Dated 30th October, 1934.
Major R. A. Wesson. Dated 16th November, 1934.

Major C. K. Lakshmanan is appointed provisionally as Port Health Officer, Calcutta, with effect from the 21st October, 1937 (afternoon), until further orders.

Major B. N. Hazara made over charge of the Barisal Jail to Dr. Monoj Nath Gupta, in the afternoon of the 30th November, 1937, and the latter made over charge of that jail to the former in the forenoon of the 6th December, 1937.

Major R. L. Frost appointed as Civil Surgeon, Myingyan, dated 16th January, 1938.

The undermentioned officers are appointed to the Civil Branch of the Indian Medical Service with effect from the 1st April, 1937. These officers will count their seniority in civil employment with effect from the dates noted against their names.

Lieutenant-Colonel C. M. Nicol. Dated 10th December, 1934.
Major D. P. Lambert. Dated 13th June, 1934.
Major R. A. Wessen. Dated 16th November, 1934.
Captain P. J. Kelly. Dated 8th July, 1934.
Captain H. S. Smithwick. Dated 29th October, 1934.
Captain E. S. S. Lucas. Dated 30th October, 1934.
Captain P. L. O'Neill. Dated 10th November, 1934.
Captain Sangham Lal. Dated 14th November, 1934.

The undermentioned I. M. S. Officers were transferred to civil employment :—

Captain J. Brebner, on 28th December, 1937, on transfer to civil Bengal.

Captain W. Happer, on 24th December, 1937, on transfer to civil Punjab.

Captain B. J. Griffiths, on 10th January, 1938, on transfer to civil U. P.

Captain W. P. Lappin, on 20th January, 1938, on transfer to civil Madras.

Captain W. McN. Niblock, on 7th January, 1938, on transfer to civil Bengal.

Captain D. Tennant, on 20th January, 1938, on transfer to civil Assam.

Captain F. A. B. Sheppard, acting District Medical Officer, East Godavari, and Superintendent, Government Headquarters Hospital, Cocanada, to act as District Medical Officer, Madras, and Superintendent, Government Headquarters Hospital and Medical Officer, District Jail, Madura, with effect from the date of taking charge, *vice* M. R. Ry. Rao Bahadur S. Padmanabha Sarma Avargal.

Captain W. P. Lappin on transfer from the Military Department, to act as Junior Specialist in Surgery in the Medical College and the King George Hospital, Vizagapatam, with effect from the date of his report to civil duty.

Captain C. F. Garfit, whose services have been placed at the disposal of the Punjab Government against the leave reserve for European Officers of the Indian Medical Service, was placed on general duty at the Mayo Hospital, Lahore, with effect from the 27th January, 1938.

Captain C. B. Miller has been reposted as Resident Medical Officer, J. J. Hospital, Bombay, with effect from the 10th January, 1938, afternoon.

Services of Captain B. J. Griffiths have been transferred to U. P. with effect from 12th January, 1938.

Captain M. H. Shah is appointed as [illegible] (0.2 to 0.7 c.c.) Officer from 16th October, 1937, and is [illegible]ective remedy Province of Delhi for employment, until [illegible]ochloride and at the Willingdon and Irwin Hospitals. [illegible]nd have the [illegible]s certain to

Captain W. Happer, on transfer from [illegible]apsules are Department to Madras Civil, to act as Dist[illegible] in liquid Officer, Guntur, and Superintendent, Govern[illegible] usually quarters Hospital, Guntur, with effect from [illegible]combined taking charge.

Captain J. Brebner, on arrival in Bengal, [illegible]ish the on general duty at the Medical College H[illegible] iodide Calcutta.

[illegible]cause [illegible] the

To be Captain (on prob.)

W. S. Davidson. Dated 1st November, 1937, seniority as Lieutenant, 22nd October, 1933, and Captain, 22nd October, 1934 (Secd.).

To be Lieutenant (on prob.)

1st November, 1937.

G. K. Beatty (Secd.).
C. W. Greene (Secd.).
G. A. Graham (Secd.).

The following officers arrived at Bombay on first appointment on 6th January, 1938 :—

Lieutenant W. A. Hopkins.
Lieutenant J. L. Mewton.
Lieutenant L. U. Kamm.
Lieutenant T. Denness.
Lieutenant J. W. R. Sarkies.

LEAVE

Lieutenant-Colonel F. Griffith proceeded on 12 months' leave ex-India, pending retirement, from 14th January, 1938.

Lieutenant A. G. Goode proceeded on 2 months' leave ex-India, pending resignation, from 18th January, 1938.

Lieutenant-Colonel Som Dutt proceeded on 2 months' leave in-India, pending retirement, from 28th January, 1938.

Lieutenant-Colonel D. R. Thomas, O.B.E., Chemical Examiner to Government, Punjab, proceeded on combined leave for nine months, with effect from the 25th January, 1938.

Lieutenant-Colonel P. Verdon, Acting Superintendent, Government Ophthalmic Hospital, Madras, and Professor of Ophthalmology, Medical College, Madras, has been granted leave ex-India for two months and sixteen days on average pay and for six months and fourteen days on half average pay, with effect from the 15th February, 1938, or the date of relief.

Major H. W. Mulligan, Assistant Director, Malaria Survey of India, on foreign service under the Indian Research Fund Association, granted leave on average pay ex-India for eight months, with effect from the afternoon of the 16th December, 1937. His services are replaced at the disposal of the Director-General, Indian Medical Service, from that date.

PROMOTION

Colonels to be Major-Generals

N. M. Wilson. Dated 16th September, 1937.
P. S. Mills, C.I.E. Dated 16th November, 1937.

Lieutenant-Colonels to be Colonels

G. G. Jolly, C.I.E. Dated 16th November, 1937, with seniority from 1st February, 1932.

H. Stott, O.B.E. Dated 16th November, 1937, with seniority from 1st February, 1932.

E. S. Phipson, C.I.E., D.S.O. Dated 1st December, 1937, with seniority from 1st February, 1932.

J. Scott, D.S.O., O.B.E. Dated 9th July, 1937, with seniority from 1st July, 1931. This promotion does not carry with it the benefits of pay and pension admissible to officers of this rank, until such time as he assumes an administrative appointment permanently.

Lieutenant-Colonel to be Brevet-Colonel

Lieutenant-Colonel J. W. Vanreenen, O.B.E. Dated 1st January, 1938.

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Majors to be Lieutenant-Colonels

J. W. F. Albuquerque. Dated 22nd December, 1937.

Major C. V. D. Rose, promotion to present rank of Major is antedated to the 25th April, 1931.

Major C. Mani, promotion to present rank of Major is antedated to 1st April, 1937, with seniority in that rank from 19th February, 1937.

The promotion of the following officers to the rank of Major notified is antedated as noted below :—

W. F. Cooper. Dated 1st April, 1937, with seniority in that rank from 2nd November, 1936.

A. K. M. Khan. Dated 1st April, 1937, with seniority in that rank from 15th January, 1937.

B. Chaudhuri. Dated 1st April, 1937, with seniority in that rank from 2nd February, 1937.

Captains to be Majors

Captain P. P. Chowdry, I.M.S. Dated 22nd November, 1937.

E. A. R. Ardeshir. Dated 16th December, 1937.

Lieutenants (on prob.) to be Captains (on prob.)

B. J. Doran. Dated 8th November, 1937, with seniority from 31st October, 1937.

J. H. Cater. Dated 31st October, 1937.

S. Shone. Dated 15th October, 1937, with seniority from 1st November, 1936.

G. W. Palmer. Dated 19th October, 1937, with seniority from 1st May, 1937.

G. F. J. Thomas. Dated 8th November, 1937, with seniority from 13th October, 1937.

Promotion and antedates

The seniority of Lieutenant W. A. Hopkins is antedated to 31st August, 1936.

RETIREMENTS

Major-General D. P. Goil. Dated 16th November, 1937.

Colonel C. E. Palmer. Dated 1st December, 1937.

Lieutenant-Colonel C. Newton-Davies, M.C. Dated 18th December, 1937.

RELINQUISHMENT

Captain J. A. L. McCullough relinquishes his probationary appointment. Dated 7th October, 1937.

Notes

ACIDOSIS AND KETOSIS

ACIDOSIS and ketosis occur in cases of starvation, obstinate vomiting, such as pernicious vomiting of pregnancy, debility in children, cyclical vomiting, delayed anæsthetic poisoning, and in pyrexial conditions; also (especially acidosis) in cases of nephritis and of poisoning by salicylates or by ammonium chloride. Ketosis also occurs frequently in diabetes, but from a different cause. The symptoms vary with the severity of the case, and may include air-hunger, sickness, drowsiness, irritability, depression, restlessness, night terrors, vomiting and, in severe cases, coma.

Treatment consists of introducing alkalis and dextrose into the patient's system. There are several ways of doing this. Bicarbonate of soda in drachm doses, dissolved in water to which lemon juice and one ounce of dextrose have been added, may be given every three hours. In more severe cases, one pint of a 10 per cent solution of dextrose and a 5 per cent solution of bicarbonate of soda may be given per rectum. In extremely severe cases, a 2.5 per cent solution of dextrose in a 5 per cent solution of sodium bicarbonate may be given intravenously. These solutions should be freshly prepared. For people who are liable to periodic attacks of ketosis, dextrose is an excellent prophylactic.

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Dextrosol is obtainable from Messrs. Corn Products Company (India), Limited, Post Box No. 2191, Calcutta, India.

PROSEPTASINE AND SOLUSEPTASINE

IN the field of chemotherapeutic research a vast amount of work has been undertaken in attempts to discover a chemical substance capable of destroying the streptococcus in a manner comparable to that in which the arsphenamines deal with the *Spirochæta pallida*. The products of these labours, however, were of little practical value until in 1935 Domagk announced the remarkable power possessed by the red dye, 4'-sulphamido-2: 4-diaminoazobenzol, of protecting mice against infection with virulent strains of hæmolytic streptococci.

A water-soluble form was later introduced for intramuscular injection, and originally also for intravenous use: but both these preparations have the disadvantage of being dye-stuffs.

Other workers discovered that their streptococcicidal activity is attributable, not to the azo dye, but to the benzene-sulphonamide portion of the molecule.

Early in 1936 Pharmaceutical Specialities (May and Baker) Ltd. were the first to introduce to the medical profession in Britain a colourless antistreptococcal drug for oral administration. That product, Proseptasine, is a derivative of *p*-aminobenzene-sulphonamide, and its toxicity is considerably less than that of the original dye product, although its curative activity is at least as good. Subsequently *p*-aminobenzene-sulphonamide, also known as sulphanilamide, was introduced, but experimentally Proseptasine has been shown to be even less toxic than this simple sulphonamide.

Following on further research and clinical trials, Soluseptasine, which is a colourless drug for intravenous administration, which may also, if desired, be given by subcutaneous or intramuscular injection, was introduced.

In the experimental streptococcæmia of the mouse, Proseptasine has a remarkable action. A highly virulent strain of streptococcus is used, and the animals employed in the test are infected with a uniform quantity of the virus. The quantity administered is usually one hundred times that which would normally prove lethal within 48 hours. The animals to which no protective dose of proseptasine has been given invariably die within 48 hours. The other test animals are given a first dose of proseptasine from half to three-quarters of an hour after the initial infection. Further doses are given on subsequent days. Comparative tests have also been carried out with other products, and it has been found that the infected animals usually survive for a longer period when treated with Proseptasine.

Soluseptasine is, like Proseptasine, a complex sulphonamide, but differs from the latter in being readily soluble in water.

There are certain urgent cases in which a therapeutic advantage may be gained by giving a drug intravenously, and Soluseptasine may be so administered with no more risk of toxic reaction than when introduced by the subcutaneous or intramuscular route. Clinical trials confirm both the streptococcicidal activity and the low toxicity of this product.

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SARDANA'S MODIFIED VACCINATION LANCET

THIS instrument is a modification of Weir's scarificator. It consists of round hollow metallic handle 4 inches long and ¾ inch in circumference. On one end of this handle is screwed a metallic plate which has four scarificating points set 1/16 inch apart, each about ¼ inch long. On the other end is screwed a narrow spatula nearly 1½ inches long with maximum width 3/16 inch at the distal end. Both these metallic pieces, the one carrying the points and the other carrying the spatula, can be reversed and screwed in such a way that they go into the hollow of the handle when not in use. The joints have been made leakproof so that the hollow of the handle can be used as container for an antiseptic lotion; the scarificator and the spatula are thus kept sterilized. The closed instrument is nearly 4¼ inches long and can be carried in an ordinary waistcoat pocket. The spatula is used for carrying lymph from the vial to the arm and rubbing it in after scarificating with the points.

The special advantage of the instrument over others is its compactness and the fact that the important parts are kept sterilized. This is of special significance for vaccinators who have to go from village to village and from field to field where facilities for quick sterilization of the instrument are scarce or non-existent.

The instrument has been manufactured by Messrs. Union Surgical and Company, Sialkot, Punjab.

M. N. SARDANA, *Captain*, A.I.R.O.,
M.B., B.S., L.R.C.P., M.R.C.S., D.O.M.S., F.R.F.P.S.
Chief Medical Officer, Bharatpur.

[*Note.*—The only criticism we have of this very ingenious instrument, which we have seen and used, is that there is nothing to keep the two washers that are not being used in position. This applies particularly when the instrument is closed. Some means of locking them on might be devised.—Editor, *I.M.G.*]

NEUTRAL ACRIFLAVINE

NEUTRAL ACRIFLAVINE—Boots (Euflavine—Boots) is a mixture of 2:8-diamino-10-methylacridinium chloride and 2:8-diaminoacridine hydrochloride. The presence of a sufficient proportion of the latter results in a more soluble product than the pure 2:8-diamino-10-methylacridinium chloride. It is an odourless brownish-red powder, soluble in water, slightly soluble in alcohol, nearly insoluble in ether, chloroform, fixed oils and liquid paraffin.

Indications

Neutral acriflavine—Boots, being a neutral product, is particularly indicated for either oral or parenteral administration, in preference to the more acid acriflavine.

Method of administration

Oral.—For oral administration neutral acriflavine is given in the form of enteric-coated tablets. The special enteric coating enables the tablets to pass through the stomach unchanged, thus avoiding gastric solution which might cause nausea; the tablets quickly disintegrate upon reaching the alkaline intestinal tract. Depending upon the degree of infection it is found that ½ gr. to 1 gr. three times a day is usually effective. It is essential, however, to ensure marked alkalinity of the urine as the bactericidal properties of acridine antiseptics are enormously enhanced in an alkaline medium.

Urinary infections.—'Infections of the kidney, whether a gross obstruction such as a calculus in the pelvis or ureter be present or not, probably cannot be sterilized by any urinary antiseptic at present available. It is possible, however, in healthy men to procure unfailingly the secretion of urine antiseptic toward both *B. coli* and staphylococcus after the administration of acriflavine combined with alkalinization' (Davis and Sharpe, *Brit. Med. Journ.*, 1934, II, 581).

'I have recently had a very stubborn case of *B. coli* infection of the kidney and bladder, and have obtained two consecutive negative cultures at two months' intervals from the use of acriflavine. Messrs. Boots have made a tablet of this drug otherwise so inconvenient to administer, which my patient has been able to take regularly' (*Brit. Med. Journ.*, 1928, II, 553).

VERITOL

KNOLL A-G., Ludwigshafen-on-Rhine, Germany, whose diuretin and cardiazol preparations have long been known for their valuable properties, have now brought out a new circulatory restorative, called 'Veritol (Knoll)', which possesses considerable advantages over adrenalin and ephedrine. Veritol is p-oxyphenyl-isopropyl-methylamine. Its action is slower yet more enduring than that of adrenalin, and unlike ephedrine, it exercises no injurious effects on the heart.

Veritol increases the volume of the circulating blood by emptying the blood depots; its action is, therefore, largely physiological. Samples for clinical trial are obtainable from Messrs. Martin and Harris, Limited, Mercantile Buildings, Lall Bazar, Calcutta.

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Original Articles

PRESENT POSITION OF THE OPIUM SMOKING HABIT IN INDIA

PART III

STUDIES ON THE PHYSICAL AND MENTAL EFFECTS PRODUCED BY OPIUM SMOKING. (AN ANALYTICAL REVIEW OF 300 OPIUM SMOKERS EXAMINED IN THE FIELD)

By R. N. CHOPRA, C.I.E., M.A., M.D., SC.D. (Cantab.), M.R.C.P. (Lond.)
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IN two previous communications the present authors have traced the history of the introduction of opium smoking into India and have described its incidence in different parts of the country. The method of preparing opium for smoking and the modes of indulgence, the types of persons addicted, and the control exercised by the state have been discussed. After a careful survey of the habit two aspects of the problem have presented themselves to us.

Firstly, that the literature and the available data with regard to the physical and mental effects produced by prolonged and habitual smoking of opium are meagre and of somewhat controversial nature.

Secondly, little attempt has been made so far to investigate the relationship between the two aspects of the opium problem, *i.e.*, eating and smoking.

We have paid attention to these aspects and have studied the bearing of climatic, racial and economic factors in connection with the causation of the habit. A series of 300 smokers were studied for prolonged periods by examination at frequent intervals. It is to be recorded that for want of proper laboratory facilities in the field many of the biochemical examinations could not be carried out.

ÆTIOLOGICAL FACTORS

(1) *Predisposing causes*

(1) *Social and environmental factors.*—A study of the conditions existing in the areas where the practice of smoking opium is common has convinced us that social and economic factors play an important part in starting and continuing this habit. The standard of social and hygienic conditions of the working classes in these areas is very low. No healthy amusements are available and the workers living under such conditions are in search of some form of diversion which will enable them to forget, at least for the time being, the monotony, hardships and worries of their daily existence. Their intellectual development is low, the housing conditions are primitive, and overcrowding is general. The temptation and need for a euphoric is therefore always there. A large proportion of the addicts we have studied in the tea gardens and forest areas in Assam and the Central Provinces said that they took to opium smoking because they had to perform strenuous work in an unhealthy climate. They believed that opium had a general stimulant action and increased their vigour and working capacity, and kept off hunger and fatigue. This belief has been responsible for the spread of the habit amongst the labouring classes in some of the tea gardens and the forest areas.

(2) *Race.*—Among the Mongolian races there appears to be an instinctive desire for a stimulant, and drugs possessing euphoric properties appear to have more attraction on account of their pleasure-giving and probably supposed aphrodisiac properties. The racial factor is in all probability responsible for the higher incidence of opium smoking in Assam and Burma as compared with any other part of India. The high incidence in the Central Provinces is, however, difficult to explain.

(3) *Heredity and contact.*—A perusal of table I shows that 94 (or 31.3 per cent) of the addicts gave a history of addiction in some member or other of the family, while in the remaining 206 (or 68.6 per cent) no other member of the family smoked the drug. Further, it will be seen that in 44 cases (14.6 per cent) one or other of the parents was an addict. In 20 cases (6.6 per cent) real uncles and grandparents were also in the habit of smoking the drug. While in 30 (10.0 per cent) more than one relation was addicted to smoking. This table brings out that association and contact are factors to be considered, while heredity plays little or no part. We have met with instances where a small dose of opium was given to a child by the parent for some minor ailment for prolonged periods leading to habit formation, or to a wife by her husband, or to a younger member of the family by an elder, leading to similar results.

TABLE I

Showing the effects of heredity and contact in a series of 300 opium smokers studied

	Father	Uncle	Mother	Grandfather	More than one relative	None
Other relatives addicted.	40	10	4	10	30	206
Percentage ..	13.3	3.3	1.3	3.3	10.0	68.6

*This work was commenced under a grant from the Indian Research Fund Association and during the last year has been carried on under the Endowment Fund of the Calcutta School of Tropical Medicine.

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We have also heard that in former days it was customary for parents to encourage their offspring and for wives to induce their husbands to smoke opium in order to avoid their indulgence in dissipation of other kinds.

(4) *Age to contract the habit.*—A large percentage of this series, that is, 225 or 75.0 per cent, started the habit at an early age, that is, between the ages of 10 and 30 years, which is the period when the individual is particularly susceptible to any sensations of an extraordinary nature, especially those pertaining to euphoria and sex. This is the dangerous period of life and contact with other smokers at this time is liable to start the habit. A perusal of table II illustrates that in 103 cases (34.3 per cent) the habit of smoking was acquired below the age of 20 years. In 122 (40.6 per cent) it was begun between the ages of 21 and 30 years. These two groups consist of young adults in whom euphoric factors and contact are important exciting causes. In both these groups there was a tendency to drift to larger doses, that is, more than 20 grains a day. In 42 (14.0 per cent) the habit developed in early middle age, that is, between 31 and 40 years, while in the remaining 33 (11.0 per cent) cases it was picked up after middle age, that is, after 40 years of age. In persons who started smoking in middle age and after, disease and hard work were important exciting causes in contradistinction to euphoria and the sexual factor which were mainly responsible at the early age.

TABLE II

Statement showing ages to contract the habit in a series of 300 opium smokers studied

	20 years and under	21 to 30 years	31 to 40 years	41 years and over	Total
Number	103	122	42	33	300
Percentage	34.3	40.6	14.0	11.0	100

(5) *Present ages of opium smokers.*—As a rule opium smokers have no idea of their age. A youth of 20 would state that he was 50 years of age and a man of 40 would say that he was 20 years old. The smokers often calculate their ages from some important event or events in their lives, the exact dates of birth being forgotten. In table III we have given the approximate ages estimated from the physical examination of the addicts.

None of the addicts in our series of 300 cases was below 12 years of age and only 2 per cent were below 20 years. This shows that at the present time the habit is not being contracted by youngsters as was the case 30 years ago. Most of the addicts seen were between 35 and 60 years of age, there being only one above 70 years. This may be due to the fact that smokers' lives are short, and they generally succumb to some intercurrent diseases and die before attaining a ripe old age.

TABLE III

Showing the present ages of addicts in our series of 300 cases studied

	Number of cases	Percentage
Between 12 and 20 years	6	2
„ 21 and 30 „	26	8.6
„ 31 and 40 „	40	13.3
„ 41 and 50 „	98	32.6
„ 51 and 60 „	105	35.0
„ 61 and 70 „	24	8.0
„ 71 and 80 „	1	0.3
	300	....

(2) *Exciting causes*

(1) *Association, pleasure and euphoria.*—A perusal of table IV will show that in this series there are 150 persons (50 per cent) who are pleasure seekers and who smoked the drug entirely for its euphoric effects. They were mostly young persons who had little to do, were ease-loving and spent most of their time in enjoyment and recreations peculiar to their class (*e.g.*, chess, dice, cock fighting, etc.). These persons started the habit because of their association with others who indulged in similar amusements and who were smokers.

In Assam, the Central Provinces and Berar, large sections of labourers in forest areas and tea estates are housed together. The opium smokers amongst them often try to tempt the non-smokers to smoke the drug. Others learn to smoke in clandestine smoking dens which are run by the traffickers in this drug.

The opium smoker should be regarded as an individual who acts as a focus of infection for susceptible individuals. In India ordinarily it is difficult to obtain prepared opium for smoking purposes, but once the acquaintance with habitual smokers is developed, ways and means of securing these preparations are found. The addicts, as a rule, do not reveal the names of the manufacturers and distributors of these preparations. When the habit is confirmed, the new consumer realizes his helplessness especially if he has had the misfortune of running short of the drug and experiencing the symptoms of sudden withdrawal. Very often he himself starts manufacturing these preparations and keeps a supply in hand in case of emergency. A smoker may have no money for his daily food, may be insufficiently clad, yet will manage to get his dope, as this is the only method of escape from the acute mental and physical sufferings produced during the period of abstinence. He will pawn or sell his personal belongings and those of his family and will try to get the drug

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even if he has to sacrifice all that he possesses in the world. The ravages caused by the habit in such persons are terrible and the moral depravity produced is indescribable.

TABLE IV

Showing the factors which were directly responsible for the opium smoking habit in a series of 300 addicts studied

	Number of cases	Percentage
1. Association, pleasure, euphoria, etc.	150	50
2. Disease ..	100	33.3
3. Hard work, fatigue, etc.	40	13.3
4. Substitute for other drug habit.	10	3.3

2. *Disease.*—Sufferings produced by disease conditions are very commonly blamed for producing drug addiction. The rôle of the disease factor was studied in detail in this series. It will be seen from a perusal of table IV that in 100 (33.3 per cent) this factor acted as an exciting cause. In a hot humid climate, such as is met with in Assam, where the incidence of cough, asthma, dysentery, typhoid, malaria, kala-azar and bowel infections is high, there is a widespread belief that the regular use of opium, whether by smoking or eating, acts as a prophylactic against, and also as a cure for, these diseases. On account of the power this drug possesses of depressing the respiratory centre the irritative cough is ameliorated. The effects upon the gastro-intestinal tract, particularly in diarrhœa and dysenteries and painful affections, are known to be rapid and very striking. These 100 cases were further analysed as to the nature of the ailment or affection which led to the use of the drug and the results are given in table V :—

TABLE V

Statement showing various diseases for which 100 addicts started opium smoking

Diseases	Percentage
1. Aches, pains and other rheumatic troubles	25
2. Cold and cough, coryza ..	14
3. Hæmoptysis ..	8
4. Asthma	12
5. Pulmonary tuberculosis	5
6. Bowel diseases (dysentery, diarrhœa, etc.)	7
7. Sciatica	4
8. Piles	2
9. Need of a general tonic ..	6
10. Palpitation of the heart ..	2
11. Spermatorrhœa	2
12. Fevers (malarial and kala-azar in origin)	10
13. Gonorrhœa	1
14. Syphilis	1
15. Enlarged spleen	1
	100

It will be observed that diseases of the respiratory system, such as cold, cough, coryza, asthma, hæmoptysis, etc., are common amongst the exciting causes. Then come aches, pains such as sciatica, neuralgia and rheumatic troubles, and then follows its use in fevers and as a general tonic and for bowel diseases. In all these instances the use of the drug was often started by suggestion at the instance of a smoker and in no case was it begun on the advice of a qualified medical practitioner.

(3) *Fatigue and hard work.*—Only in 40 cases (13.3 per cent) was the habit started to enable the addict to bear the strain and stress of hard work.

(4) *As a substitute for alcohol and other drug habits.*—A glance at table IV will show that 10 addicts (3.3 per cent) in this series took to opium smoking as a substitute for such drug habits as alcohol and cocaine. These addicts stated that a few whiffs of opium satisfied their cravings for cocaine and alcohol, and therefore the desire for these drugs was minimized with comparatively smaller doses of opium smoking. All these ten individuals were weaklings of vicious temperament who were given to multiple drug habits and excessive drinking. The reason for substituting opium smoking often was that they found it less expensive than cocaine or alcohol.

SYMPTOMATOLOGY

From the description already given it is evident that the two preparations of opium used for smoking, *madak* and *chandu*, vary a great deal in their potency. Most of the Indian smokers indulge in *madak* which is considerably less potent, while *chandu*, the stronger preparation, is smoked by very few, but particularly by those who are addicted to large doses of the drug and in whom marked tolerance has developed. The symptoms produced in both groups are very much alike.

The following description of symptoms produced by smoking of opium in Indian smokers has been compiled from the description given by habitual smokers themselves. We were able to divide the smokers into four groups. Practically every individual passed through all the four stages unless he gave up the habit early.

I. *New habitues.*—In persons who have just started smoking opium, the symptoms produced are those of euphoria. At the onset the senses become momentarily keen; the stimulant effects are produced by the first pull; physical pains of whatever nature disappear or become abated; there is a feeling of elation, followed by a delightful languid ease, exalted sense of superiority, and later on sleep with pleasant dreams. As smoking progresses the smoker becomes dull and drowsy. If at this time he receives some important and exciting news, he takes little notice of it and indulges in another smoke. Soon after he has finished the first pipe

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the smoker becomes talkative and communicative. He talks of politics, religion, poetry, and other subjects of special interest to himself. The facts are often exaggerated and he is overconfident of his powers and superiority. He mostly talks of his personal affairs and thinks that he is logical in all his expressions and conclusions. He is disposed to criticize others and is anxious to prove all sorts of fantastic theories in order to impress his hearers (who are generally smokers themselves) and who listen attentively. Time is of little consequence. The smoker becomes a slave to the habit and the evil is enhanced by the bad surroundings in which the habit is generally indulged in.

II. *Early stages of addiction.*—As the habit takes root the individuals gradually become conscious of the danger and ill effects of the practice. Attempts and efforts are often made to give up the habit and a constant struggle seems to be going on between his sense of caution on the one hand and his desire for euphoria on the other. The symptoms produced are similar to those produced in the first group, but are less marked. There is a general attitude of hesitation during this period and the habit is continued partly because of its pleasure-giving effects and partly because of the dread of the abstinence symptoms.

III. *The stage when the habit is established.*—Prolonged use of the drug is apt to produce permanent changes in the system. The mental and moral faculties are affected and the addict behaves more or less like an abnormal individual. After the drug is smoked the symptoms of incompetency and inhibition present during the abstinence period completely disappear. The drug, however, is able to produce only a temporary sense of well-being, and no marked euphoria or intoxication, as is seen in the first two stages. Addicts at this stage have a desire to give up the habit, but are unable to do so on account of the dread of the withdrawal symptoms.

IV. *Stage of long-standing addiction.*—The old habitués if they do not change their mode of consumption are apt to get into a stage of cachexia or inanition. The mental and physical changes are much more marked in this group than in the previous three groups. The physical changes may go on to actual dementia. The individual is pale, thin and is subject to all intercurrent diseases. The craving for the drug is greater than ever. When the drug is smoked by such individuals the euphoric symptoms are absent. The only effect produced is a short-lived feeling of normality after indulging in a smoke. The feeling of constant and general depression always present is overcome for the time being. If smoking cannot be indulged in at the proper time there is great prostration, vertigo, torpor, discharge of water from the eyes, acute distress and insomnia. All these feelings are overcome for the time being by the smoking of a single pipe of opium.

Withdrawal

Most opium smokers smoke the drug because of the very distressing symptoms which are produced if they do not smoke it. Prolonged indulgence often fails to give pleasurable sensations, yet he must go on smoking in order to avert the crisis of withdrawal symptoms. The horror of pain both mental and physical is an obsession which the smoker dreads. The abstinence or withdrawal symptoms in case of opium eating and smoking are the same, there being a question of degree. As a rule the symptoms set in more rapidly and are more intense in smokers than in eaters. The early symptoms are yawning, sneezing, nausea, vomiting, and mucous secretion resulting from stimulation of the medulla; abdominal pains and diarrhœa occur from stimulation of Auerbach's plexuses; the twitchings, cramps, circulatory troubles (rapid pulse, arrhythmia), and sometimes convulsions and collapses are due to excessive stimulation of the cortical cells. A chilly sensation is felt all over the body and there are general aches and pains. Sometimes there is a peculiar dull, drawing, dry and burning sensation in the region of the pharynx and larynx which may be followed by severe pains in the shoulders and muscles of the calves and thighs. In some there is involuntary discharge of semen even when widely awake. A patient seen with these symptoms, even when in a state of collapse, after a few pulls at the pipe exhibits a transformation almost miraculous; he becomes in a few minutes a relatively normal person.

Whatever peculiar characteristic of mind or accidental incidents may determine the formation of the habit, when once it is formed the patient has a real disease, and he can only exist free from great physical and mental pain when he is under the influence of the drug. Thus the symptoms of abstinence vary from an initial anxiety and uneasiness and a feeling of weakness to a state of severe shock, which in feeble persons may have serious consequences. If opium is administered the symptoms quickly disappear and if the addict is too weak to inhale, opium smoke is blown into his nostrils. It is said that if the mother is an addict, her child may have to be revived from time to time in the same way. Though the dose has to be continually increased, the craving never reaches such a great intensity as in those who take morphine by injection. This is probably due to the fact that the amount of morphine actually absorbed from the smoke is very small.

AN ANALYSIS OF THE PHYSICAL EFFECTS AS OBSERVED IN A SERIES OF 300 OPIUM SMOKERS

In a previous paper (1935) the present authors gave the results of their comprehensive studies regarding the physical and mental effects produced by opium eating in this country.

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The question with regard to effects produced by opium smoking was left for a further study. The lines of investigation followed in this series of 300 opium smokers were the same as with opium eaters.

General appearances.—The addicts in this series were mostly labourers working on the tea estates in the Assam valley. Contrary to what may be expected of people leading an open-air life, the majority of these workers did not look healthy, even at their best. It is not surprising therefore that the majority of the smokers examined were found to have poor physique, had flabby musculature and defective posture, and looked cheerless and morose. Out of 300 smokers examined 270 (90 per cent) were males and 30 (10 per cent) were females. They had a pale, sallow countenance, wrinkled face, eyes devoid of lustre and looked altogether miserable specimens of humanity.

Height and chest measurements and body-weight.—Unlike opium eaters (Chopra and Chopra, 1935) their height and chest measurements were below the standard.

The effect of opium smoking on the body-weight was carefully studied and compared with that of a series of opium eaters of the same locality.

It was found that opium, when it is smoked in small doses (5 to 6 grains daily), affects the weight to a lesser extent than when it is eaten. In those who smoke more than 10 grains a day, the effects of opium smoking on the body-weight appear to be more pronounced than opium eating. For example, in individuals who smoked more than 20 grains a day, the shortage of weight per individual was as much as 25 lb. against 17 lb. in the case of opium eaters as compared with the average of non-addicts.

TABLE VI

Showing effects of opium smoking on body-weight as studied in a series of 300 *opium smokers*

Doses	Average loss in weight per individual in pounds	
	Opium smokers	Opium eaters
5 grains and under ..	14.5 lb.	15.8 lb.
6 to 10 grains ..	15.5 „	15.9 „
11 to 20 grains ..	18.8 „	18.8 „
21 grains and over ..	25.0 „	17.0 „

Respiratory system.—The incidence of diseases of the respiratory system appears to be very high. Thus 146 or 48.6 per cent suffered from one ailment or other of the respiratory tract (table VII). It may be observed that most of the habitués were weak, emaciated, lived in mud huts thatched with grass which were damp and badly ventilated, and were usually overcrowded at night. These individuals, therefore, fell an easy victim to respiratory troubles. Five cases in this series suffered from dry pleurisy and 15 from pulmonary tuberculosis. Among quite a large number of opium smokers the type of respiration even in male adults is more of the abdominal than of the thoracic type and the amount of tidal air is less than in normal healthy persons on account of smaller range of chest expansion. Pneumonia is more common and more fatal among the smokers. Chronic bronchitis with emphysema was often present and history of asthmatic attacks was common. Opium smokers are very susceptible to infection of the respiratory tract and influenza, cold and coughs are very common among them. A number of them suffered from chronic infections of nasal sinuses.

Central nervous system.—Forty or 13.3 per cent (table VII) were found to suffer from disorders of the central nervous system. The symptoms varied from a minor degree of neurosis to marked hysteria and hypochondriasis. Three individuals in this series were actually demented. We observed that the smokers were mentally sluggish though this state could be overcome

TABLE VII

Physical examination of the addicts

Summary of the effects of the opium habit on different parts of the system as observed in 300 *addicts*

Disease	Number of cases	Percentage in the series
I. Respiratory system.		
Poor expansion of chest	36	12
Tuberculosis ..	15	5.3
Pleurisy	5	1.6
Chronic bronchitis with emphysema.	12	4
Chronic pharyngitis ..	40	13.3
Asthma	12	4
Influenza	24	8
Ozæna	2	0.06
TOTAL ..	146	48.6
II. Eye diseases.		
Conjunctivitis, pannus, trachoma, trachitis, blepharitis, etc.	35	11.6
III. Gastro-intestinal system.		
Anorexia	20	6.6
Piles and dysentery ..	110	33.3
Constipation ..	28	9.3
Diarrhœa	10	3.3
Flatulent dyspepsia ..	19	6.3
TOTAL ..	187	62.3
IV. Miscellaneous diseases.		
Venereal diseases ..	20	6.6
Ear diseases ..	2	0.06
Skin diseases ..	38	12.6
Enlarged glands ..	2	0.06
Filariasis (elephantiasis)	13	4.3
Hydrocele	10	3.3
Imbecility	1	0.03
Arthritis and synovitis	12	4.0
Mental defects ..	2	0.06
Infantilism ..	1	0.03
Fits	1	0.03
Leprosy	1	0.03
Tumour	1	0.03
Nervous disorders like hypochondriasis, neurosis, etc.	40	13.3
Dementia	3	1
Premature senility ..	80	26.6
TOTAL ..	227	75.6
V. Cardio-vascular system.		
Valvular disease of the heart.	3	0.033
Varicose veins ..	5	1.6
Anæmia	60	20.0
Marked degree of anæmia with pain in abdomen (probably of hook-worm origin).	13	4.3
TOTAL ..	81	25.933

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for the time being with a few whiffs of opium smoke. The heavy smokers looked dull and apathetic and seemed to have lost interest in their accustomed pursuits and cared for nobody except themselves. Their idea of time and space was not precise and they lacked the sense of responsibility. When not under the influence of the drug they are often restless and miserable. Insomnia is a very common complaint among them. Intellectual and moral deterioration are common among them.

Cardio-vascular system.—The signs of general atony were observed in most of the opium smokers. The cardiac impulse was often weak and peripheral circulation was sluggish as shown by weak and thready pulse. The incidence of heart and blood-vessel diseases was remarkably low among the series in spite of the fact that many suffered from rheumatic troubles, septic tonsils and pyorrhœa alveolaris. Even in addicts of advanced age the blood vessels were remarkably good and blood pressure was low. The arcus senilis was frequently present; varicose veins were uncommon, but hæmorrhoids were frequently seen. Besides a certain amount of anæmia which was frequently met with, no other disorders of the blood were encountered. The peculiar pale and sallow complexion and haggard look are characteristics of heavy smokers.

Gastro-intestinal system.—One hundred and eighty-seven persons or 62.3 per cent out of 300 (table VII) complained of ailments pertaining to the alimentary tract. One hundred and ten stated that they had suffered from time to time from pain in the abdomen with passage of blood and mucus in the stools. Most of these were probably cases of chronic amœbiasis or bacillary dysentery who took to the use of the drug for alleviation of their symptoms. Nineteen persons in this series suffered from flatulent dyspepsia, 28 from constipation and 10 from diarrhœa. These figures are higher as compared with those normally obtained in that locality in case of non-habitués.

Eyes.—Thirty-five addicts had extensive leucomata, the result of the corneal ulceration. Most of them suffered from trachoma and blepharitis and many said that they had taken to smoking opium for trouble in connection with their eyes.

Venereal diseases.—Twenty addicts (or 6.6 per cent, table VII) gave history of exposure and contracting venereal diseases. No cases of primary syphilis were seen but secondary manifestation in the throat and skin eruptions were frequently encountered among the addicts. The use of common smoking pipes may have helped to spread the infection. No cases of neuro-syphilis were observed.

Skin.—Skin diseases were common on account of dirt and vermin with which these people were infested. Scabies was common and psoriasis was also seen in a few instances. Acne vulgaris was commonly seen associated with staphylococcal infection on the face, chest and back. The skin of the face in such cases had a thickened appearance. Ulcers of a tuberculous and specific nature were seen in some cases. Four cases of nodular type of leprosy were seen.

Premature senility.—A perusal of table VII will show that 80 (26.6 per cent) persons looked older than their actual ages. This is a common sequence of the opium smoking habit. Arcus senilis is generally seen after 40 as compared with persons beyond 60 in normal course of events.

Effects upon sexual impulses

The addicts' ideas and experience have been summarized in tabular form in table VIII. It will be observed that there were 20, or 6.6 per cent, who ascribed stimulating powers to the drug while 158, or 52.6 per cent, said that the drug was a stimulant at first but depressant later; 42, or 14.0 per cent, said that it always produced depression, while 80, or 26.6 per cent, gave out that the drug had no effect at all on sexual powers. Among certain classes of the lower strata of society in certain parts of India, it is not uncommon to indulge in opium before the sexual act and this has been responsible for starting the opium habit in a number of cases. It is believed by the laity that, unlike alcohol and cocaine, opium by whatever method it is taken prolongs the sexual act without increasing the desire for it. Opium smoking for this reason is often resorted to along with *ganja, charas* and alcohol by dissipated and licentious persons. In the case of individuals who smoked large doses sexual stimulation was entirely absent. In extreme cases the habit had even led to complete loss of sexual desires and emotions.

Some of the male smokers who were smoking large doses over prolonged periods complained of complete loss of sexual desire. But when the drug was withdrawn, in a certain number of them, there was exaggeration of the desire and some suffered from frequent seminal discharges. The female smokers suffered from dysmenorrhœa and sterility. Further, the percentage of sterile marriages was much higher in our series as compared with the normal ones.

TABLE VIII

Showing the effect of opium smoking on sexual impulse

Effects	Number of cases	Percentage
1. Aphrodisiac ..	20	6.6
2. Stimulating during early stages but depressing later on.	158	52.6
3. Depressant from the beginning.	42	14.0
4. No effects noticed ..	80	26.6

DOSAGE

The addicts in this series smoked opium varying from 2 to 180 grains a day. A perusal of table IX will show that 40 persons, or 13.3 per cent, in this series smoked 1 to 5 grains a day, 82, or 27.3 per cent, 6 to 10 grains, 109, or 36.3 per cent, 11 to 20 grains, and 69, or 26.3 per cent, over 20 grains a day.

TABLE IX

Showing an analysis of 300 opium smokers according to the dosage of opium smoked daily

Daily dose	Number of cases	Percentage
1 to 5 grains ..	40	13.3
6 to 10 grains ..	82	27.3
11 to 20 grains ..	109	36.3
21 grains and up ..	69	26.3

It will be seen that the majority, *i.e.*, 78 or 62.6 per cent, smoked the drug in doses more than 10 grains a day. The average daily dose

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in this series taken as a whole works out at 25 grains a day as compared with 10 grains in our series of 1,078 opium eaters (Chopra and Chopra, 1935). The addicts generally start with small doses, say between 2 to 4 grains a day to begin with, and during this period the drug is smoked occasionally as a substitute for opium eating or after a day's hard work, or on a cold winter day. The habit to begin with has not a strong hold on the individual and can be given up when the so-called necessity has passed off. It is, however, often restarted on the slightest pretext. Most of the occasional smokers after such use of opium feel after some time that they are unable to get the same effects by taking the drug by mouth as by smoking, and find some difficulty in following their ordinary routine work without indulging in a smoke once in 24 hours. The habit thus becomes firmly established.

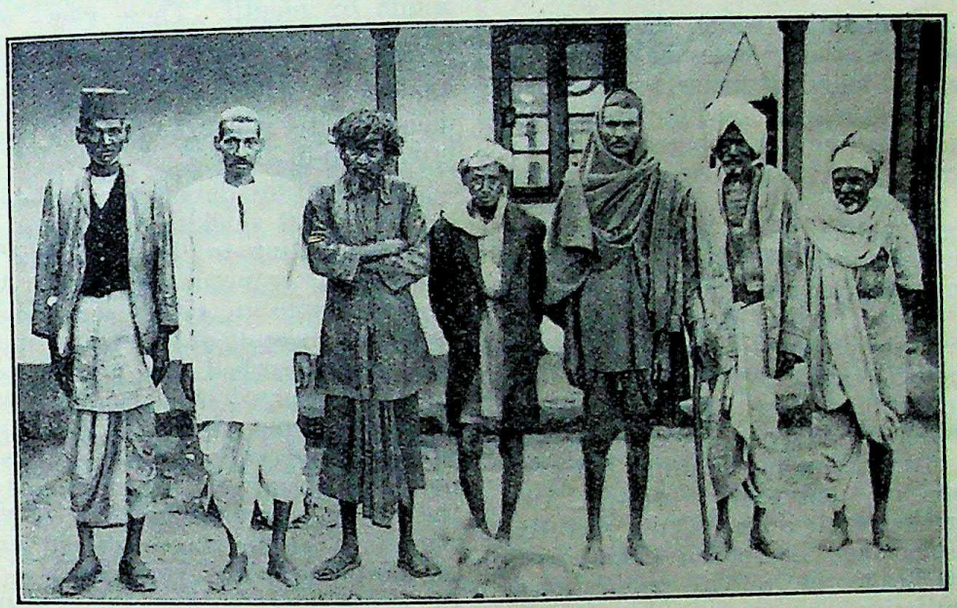
It was also observed that those starting the drug under 20 years of age or between 21 and 30 years increased the dose rapidly and reached the maximum limits within three to four years. These are young individuals in whom association, euphoria and sexual factors are the main reasons for smoking the drug. When the habit is formed on account of physical debility, pain, rheumatism, etc., the addict as a rule remains satisfied with a smaller dose, *e.g.*, less than 5 grains a day.

Opium smoking and crime

It was not possible to trace any relation between opium smoking and crimes of violent nature. The crimes committed by opium smokers as a rule were of minor character because the addict being lazy and indifferent dislikes violent physical exertion and therefore is incapable of committing daring acts of violence. In this respect, an opium smoker differs from the *ganja* and *charas* smokers, who often are excited and maniac, and commit serious crimes, such as the act of murder. The opium smoker only commits minor offences if he cannot otherwise obtain the means of buying opium to satisfy his craving.

Duration of the habit

In 70 per cent of the habitués the habit had lasted for over 10 years (table X), in 20.3 per cent from 5 to 10 years, and in the remaining 9.6 per cent less than 5 years. In opium smokers of under 5 years' duration, the ætiological factor was generally disease or ailment, the euphoric factor being less prominent. In the addicts in which habit had lasted up to 10 years, the disease factor may or may not play a part; in those of more than 10 years' standing, pleasure and association were the main causes.



A group of opium smokers.

TABLE X

Showing duration of the habit

Duration in years	Number of cases	Percentage
5 years and under ..	29	9.7
5 to 10 years ..	61	20.3
10 years and above ..	210	70
	300	....

Diagnosis of opium smoking habit

An opium smoker will endeavour to conceal his habit as long as possible. He realizes that his profession or business will suffer if this is discovered. In the majority of

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instances he knows that he is doing wrong. The critical time comes when he cannot get the drug when he needs it and the abstinence symptoms set in. The appearance of nervousness and a feeling of uneasiness indicate that it is time he should have the drug. If he still does not get it, his sufferings increase and he gets muscular pains, cramps, and sometimes diarrhœa. These are the usual symptoms of sudden withdrawal of the drug and their intensity varies in different individuals, according to the doses they take and the time the habit has lasted. Ordinarily an addict never allows himself to come to this condition, as he gets his dose as soon as he feels the call for it and this restores his equilibrium. If, however, his supply is not forthcoming or is delayed, the abstinence symptoms set in and in this condition the diagnosis of the habit can be readily made.

The other period during which the condition can be diagnosed is shortly after indulgence in the drug when the addict is under its influence. If the dose is not adjusted and a larger dose than usual is taken, the addict becomes drowsy and may even be found asleep at some unusual place and at some unusual hour, when his condition becomes apparent to his friends or employer. These are the two things in the life of every addict which sooner or later come to pass. With those taking larger doses the chances of discovery are greater, as the abstinence symptoms in them are severe and they are likely to overdose themselves. Finally, attempts have been made to diagnose opium smoking by detection of morphine in the urine, but even micro-methods are uncertain, especially with those who smoke small doses. Quite recently, however, Tosomei and Li-cho-zen (1936) have described in a League of Nations' publication a test for quantitative estimation of morphine in the urine, by the aid of which they claim to be able to detect clandestine opium smokers and morphine addicts, also to deduce the amount of morphine consumed or injected. The present authors however follow the method of Deckert (1936)* with success in case of opium eaters.

* Ten c.cm. of the urine are heated with 0.3 gm. of Na_2CO_3 until the first bubbles rise and is then quickly cooled. It is then transferred to a separating funnel and thoroughly shaken with 10 c.cm. of acetic ether. After the layers have separated, the acetic-ether layer is transferred to a small porcelain dish through a filter-paper and evaporated to dryness on a water-bath. The residue is diluted in 0.25 c.cm. of water with one drop of nitric acid (sp. gr. 1.15) and a drop of 10 per cent ammonium molybdate solution added. After careful whirling of the porcelain dish, the contents are filtered through a compressed-cotton plug placed in the upper part of the neck of a funnel. The dish is rinsed with two successive quantities of water (0.25 c.cm. and 0.15 c.cm.) which are passed through the filter. The cotton plug is then passed down to the lower opening of the funnel, so that no filtrate remains in the funnel. A drop of 2 per cent solution of ammonium vandate is then added and well mixed. Depending on the morphic content a turbidity develops.

Opium smoking and opium eating

Smoking and eating of opium are different aspects of the same problem though the former is believed to be more harmful than the latter. The use of opium *dross* is very uncommon in this country and it is admitted that this practice is much more harmful than smoking of opium.

The Excise Commissioner of Burma some years ago undertook an enquiry into the question of the relative harmfulness of opium smoking and opium eating. He came to the conclusion that in regard to the individual addict there is no difference in the degree of harmfulness. When larger masses of humanity are considered, however, smoking appears to be more harmful than eating, because it is more likely to attract new devotees than taking of opium by mouth. These views were accepted, and the Government of Burma in 1924 enforced compulsory registration of opium smokers and allowed no new smokers to be registered. Six months after this compulsory registration was brought into force.

No scientific data are available to support the view that smoking of opium is more harmful than eating to the individual addict. The opium smoker needs very much larger quantities of opium to satisfy his craving than the eater, but, in spite of the smaller quantities of the morphine absorbed, the practice appears to be more harmful. The harm done cannot depend on the amount of morphine absorbed during smoking and eating. That the opium smoker does not absorb all the morphine contained in the opium is proved by the fact that the *dross* remaining in the pipe contains large quantities of morphine. The percentage of morphine in the *dross* depends upon the percentage of morphine in the prepared opium smoked, and the type of pipe used and on the way it is smoked. Experiments in the Straits Settlements indicate that the smoke from an opium pipe does not ordinarily contain more than 1/10 of the total amount of morphine contained in the opium smoked. When a man eats opium he absorbs almost all the morphine contained in the dose. It would thus appear that other factors are involved which can only be ascertained by further study.

Opium smoking is generally looked upon with more disfavour than opium eating, partly because it is considered to be more injurious and partly because it is far more expensive both as regards time and money. The process of preparation is a long one and the actual smoking naturally takes longer than swallowing pills or a mixture of opium and water. As regards the difference in the expense between the two forms of consumption, this may be judged from the fact that those who require 180 grains daily as smokers may be content with eating only 10 grains a day. For these reasons the smoking of opium is very often abandoned during later

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stages of addiction when the dose has become very large. The abstinence symptoms in the smokers are more pronounced and they often undergo terrible mental agony and sufferings, often worse than opium eaters. The smoking habit more often is the outcome of the euphoric or pleasure-giving effects of the drug, while such causes of the disease as fatigue and old age frequently produce the habit of eating opium. Further, smoking of opium attracts the younger people while opium eating is generally the habit of older age. The increase in dosage in case of smokers is much more rapid and marked probably due to the fact that the amount of morphine absorbed is smaller.

The chemical changes which the constituents of opium must undergo by drastic heating during the process of preparation for smoking must be considered. Their exact nature is not known but it would appear that with each heating the effect of opium becomes more potent and of greater danger to the smoker.

The active principle of opium smoke.—Dr. Pott of the Pharmacological Institute of Freiburg has actually demonstrated that morphine can be sublimed unchanged and therefore is actually present in the opium smoke. Furthermore, he has succeeded in demonstrating that the action of the smoke is due to the presence of undecomposed morphine. Indeed some of the more subtle and characteristic toxicologic effects of morphine can be produced by inhalation of opium smoke or its condensation products. It is interesting to note that Pott succeeded in inducing specific morphine reactions in mice by injecting preparations made from the blood of larger animals that had been made to inhale opium smoke.

In evaluating the effects produced by smoking, the non-alkaloidal constituents must also be taken into consideration. It is quite probable that the alkaloidal constituents are not solely responsible for the effects produced on the smokers. It is probable that the products of combustion might also play an important part. In the case of tobacco, a considerable amount of work has been done and the conclusions regarding the constituents of the smoke which are harmful are definite. Similar studies in the case of opium smoke were taken up by Dixon, but unfortunately the work was not completed and further investigation is necessary to come to definite conclusions.

Tobacco and opium smoke.—In table XI are given the composition of the smoke obtained from cigarettes and opium pipes, in conditions approximating to those which occur in smoking.

It will be seen that in the opium smoke, nicotine and carbon monoxide are entirely absent and these form the chief active constituents of tobacco smoke and are responsible for many of the ill effects that are produced. Such symptoms as vertigo, tremors, nausea and amnesia for the recent events are absent in

TABLE XI

Showing composition of opium and tobacco smoke according to Dixon

	100 gm. tobacco burnt as cigarettes	100 gm. *dross* opium containing 7.35 per cent morphine
Hydrocyanic acid	0.080	0.010
Pyridine ..	0.146	0.147
Nicotine ..	0.165	....
Ammonia ..	0.360	0.395
Carbon monoxide	410 c.cm.	....
Morphine ..	....	0.016 (0.1 from *chandu* smoke)

case of opium smokers while they are common among tobacco smokers. In the case of opium smoke on the other hand, morphine and pyridine bases are predominant and may perhaps by producing synergistic effects be responsible for producing the effects on the central nervous system.

Prevention of the habit

Education and improved standard of living are the most effective forces that have operated against the spread of the habit in this country. With the improved standard of living follows an increase of purchasing capacity of the population in general which creates a demand for and possibility of affording healthful recreations, such as outdoor games and amusements in the form of cinemas, etc. For these reasons the habit has greatly declined in certain industrial areas, such as in Digboi and various tea gardens in Assam, whereas in the undeveloped parts it is prevalent to a considerable extent. Unless the general, hygienic and economic conditions of the people are improved prohibitory legislation will not be effective.

Treatment of the established habit

The treatment of the opium smoking habit is the same as that of opium eating and has been described by the present authors in detail in a previous paper (1937). Experience in India has shown that the opium smoking habit is more difficult to get rid of than the opium eating habit. When treating these cases, the personality of the addict, the age, the physical condition, the intercurrent diseases and ailments from which he has been suffering, the doses he is taking, and the duration of addiction are all important factors and should be kept in view. We found that the young and healthy addicts taking moderate doses responded to the treatment much more readily than those who are advanced in age and had been taking large doses, for over prolonged periods. An effective cure requires firm willpower on the part of the addict and a determined resolution not to succumb to the temptation again. In order to effect a permanent cure and to prevent the addicts from relapsing into

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the habit, it is necessary to keep them away from other smokers. This is difficult in the case of addicts who undergo ambulatory treatment outside. The patients we treated in the Carmichael Hospital for Tropical Diseases were not allowed contact with outsiders and were kept under strict supervision. The cure of confirmed opium smokers should be undertaken in hospitals or an institution where the necessary strict control can be exercised. Our experience is that, if the segregation is not complete and prolonged, there is a likelihood of a relapse occurring when the individuals get into the company of smokers again. It is therefore advisable to adopt measures of a social character aiming at keeping the cured persons in favourable surroundings and to provide them with moral support to withstand the temptation.

SUMMARY AND DISCUSSION

In part I, the history of opium smoking in India and its incidence in various parts of the country have been described. Even up to the beginning of the nineteenth century no writer has recorded smoking of opium by the people of India, although it prevailed in China. Tobacco smoking was introduced into India in the latter part of the sixteenth century and it is evident that in the case of India, as of China, opium smoking was simply an outcome of tobacco smoking. It is uncertain how this habit was brought into this country, but fortunately it never assumed such a menacing aspect as it did in China. Our present enquiries show that the habit of smoking opium in one form or other is met with on a small scale in many of the large towns in India. A general survey of the incidence of the habit has been carried out in different provinces and the results have been summarized. It would appear that the habit of smoking has considerably declined during the last 30 years. Opium smoking has always been looked down upon throughout the country and stringent regulations have been enacted against it. In most parts of India, therefore, this is a very uncommon method of consumption of opium at the present time. The only exceptions to this rule are Assam and the Central Provinces where opium smoking is almost as common as opium eating.

In part II the methods of preparing opium for smoking, the modes of indulgence, the type of persons addicted, and the control exercised by the state have been discussed.

In part III an analytical study of 300 cases of opium smoking studied by the authors is given. The following conclusions can be drawn :—

(*i*) *Causation.*—From the field studies made in the areas where the practice is more common, social and economic factors were found to be instrumental in the spread of this habit. The main causes of addiction in these series were:—(1) Association with other addicts which accounted for 50 per cent of cases; (2) diseases or minor ailments for which no medical advice was sought, 33.3 per cent; (3) hard work, worry or strain, 13.3 per cent; (4) substitute for alcohol, 3.4 per cent.

(*ii*) *Duration.*—In 70 per cent of the addicts, the habit had lasted for over 10 years, in 20.3 per cent from 5 to 10 years and in the remaining 9.7 per cent less than 5 years. In opium smokers of under 5 years' duration, the ætiological factor was generally diseases or ailments, the euphoric factor being not prominent. In the groups in which habit had lasted up to 10 years, disease may or may not play a part in causation; in those of more than 10 years' standing, pleasure and association were mainly responsible for the habit.

(*iii*) *Age of commencement.*—The commonest age at which the habit is contracted is between 21 and 30 years and as many as 40 per cent in this series started it at that period of life.

(*iv*) *Dosage.*—The dosage in our series ranged from 1 to 180 grains of opium daily and in some cases much larger amounts were smoked. The majority, *i.e.*, 66.1 per cent, smoke doses larger than 11 grains a day. Doses of those who smoked opium to enable them to do hard work varied from 6 to 10 grains and of those who smoked it for euphoric purposes and as a substitute for alcohol, 21 grains and over. It appears that when the habit is acquired by association, the daily amount consumed is increased rapidly, the majority in this group taking over 10 grains a day. When the habit is formed on account of physical debility, pain, rheumatism, the addicts as a rule remain satisfied with much smaller doses (often less than 5 grains daily).

The effect on the health of moderate smokers has also been discussed. The excessive smokers are as a rule thin, emaciated and underweight individuals. They have a shallow and muddy complexion, with dull, lustreless and sunken eyes. The habit, when indulged in to excess, imparts a pallid and haggard look to the features. Persons smoking very large doses showed rapid loss of weight and in a few instances suffered from general cachexia. The skin loses its natural appearance and is often pale and dry with scales. The nails, teeth, and hair are also often diseased. When the drug has been abused for a long time the sexual impulse is deficient and often wanting altogether. Throat is often irritable and the addict is constantly subject to attacks of tonsillitis, pharyngitis and chronic bronchitis and emphysema.

The daily consumption of large doses of the drug causes stagnation in the alimentary tract as a result of which the appetite diminishes and the food taken is not properly assimilated. There may be constipation alternating with diarrhœa. The addict is more liable to be affected by vicissitudes of weather and insanitary surroundings on account of his lowered vitality.

The stimulant effects of the drug are appreciated by the habitué only during early stages

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of addiction. Gradually these disappear and in a few months necessity for further increase of the dose is imperative if the desired euphoric effects are to be obtained. This produces a weakening of the mental faculties of the addict and there is subordination of everything towards the one object of satisfying the craving. Opium smoking appears to become the main object of life. The mental effects produced are proportionate to the dosage consumed and general power of resistance of the habitué. Prolonged and excessive smoking produces a lethargic state of mind, with dulling of the mental process, gradual loss of will-power, and neglect of work. The facial expression in the case of the excessive consumer is vacant and a number amongst them suffer from tremors of the fingers and hands. The intellectual faculties show a rapid decline and most of the habitués become indifferent to their surroundings. Some of them become so dull and apathetic that even hunger and extreme poverty give them no incentive for work. In cases of excessive smokers the moral faculties are also affected. They become unreliable and dishonest and will do anything, however nefarious, to secure opium to satisfy their craving. The sense of discrimination between right and wrong is considerably weakened.

The degree of the harm resulting from opium smoking depends upon a number of factors, *e.g.*, race, environment, economic conditions, dosage, age and occupation of the addicts. Amongst the series of addicts studied by us it was observed that Chinese addicts as a rule suffered less than the Indian from the effects of the large doses. This is due to the fact that they can exercise better control over themselves, and very often keep to moderate doses which the age-long experience with the use of the drugs has taught them. They measure their dose accurately and with precision and keep the daily consumption within proper limits to a quantity that does not interfere with their earning capacity by undermining their general health. Although the average daily dose taken by the Chinese addicts was nearly two to three times larger than by Indian addicts, the ill effects were less marked in the former. This may possibly be the reason why opium smoking has established itself with stronger footing in certain parts of Assam and Burma, which are inhabited by people racially allied to Chinese.

The effects of an unhygienic mode of living, neglect of general health, lowered standard of living, and the use of a common pipe are responsible for the spread of such diseases as syphilis, tuberculosis, and pyorrhœa.

In many of the smokers, the cost of the drug consumed is more than their earnings. In others 30 to 60 per cent of their earnings are spent towards the purchase of the drug. With the small amount of money left after buying opium it is difficult for the addict to maintain himself and

(*Continued at foot of next column*)

THE INCIDENCE OF RHEUMATIC INFECTION IN INDIA

(AS JUDGED BY THE ADMISSION AND POST-MORTEM RATES AND BY THE CLINICAL EXPERIENCE OF TEACHING PHYSICIANS AT THE MEDICAL COLLEGES AND SCHOOLS OF INDIA): PART I

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ADMISSIONS FOR ACUTE AND FOR SUB-ACUTE RHEUMATIC INFECTION

1. *Type incidence*

OF the nine admissions for acute rheumatic infection (1930–36) in the Thomason Hospital, the admission rate for 1,000 medical admissions works out at 1.17. Of these admissions, four or 44 per cent were for acute rheumatic fever, an equal number for endo- or peri-carditis and one or 11 per cent for chorea. No mention is made in the records of the presence or absence of

(*Continued from previous column*)

his family. In order to make both ends meet the addict tries to stimulate his physical energies artificially by further increasing the dose and tries to do more work which further undermines the health, thereby further decreasing his working and earning capacity, and after some time there is total loss and the addict becomes useless to himself and society. In the case of well-to-do and healthy individuals who can afford nutritious food, the adverse effects may not be easily discernible during the early stages. The poor classes suffer from the very beginning as they are ill-nourished and have a lower power of resistance. The incapacity caused in the latter is more serious and responsible for considerable economic loss to the country. These factors are probably responsible for backwardness and slow progress of various parts of Assam and the Central Provinces.

Excessive indulgence in opium smoking produces :—(1) Economic loss by reducing the earning capacity of the addicts; (2) damage to health and loss of physical energy and deterioration of intellect; (3) curtailment of longevity.

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* Readers are referred to parts I and II, pp. 89 and 138 for other references.

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rheumatic nodules in these cases of poly-synovitis or carditis groups. Table I shows the admission rate per 1,000 medical admissions :—

There were no admissions during the hot dry months, and the maximum admissions were during the damp months of September and October. Agra is a comparatively dry place, with an average annual rainfall of about 20 to 25 inches only, and it is significant that six out of nine cases have been admitted during the hot damp months of September, when the rainfall is heavy and the liability to chill high.

TABLE I

Years	Poly-synovitis	Endo-carditis	Peri-carditis	Chorea only	Total acute rheumatic infection	Total medical admissions	Acute rheumatic infection per 1,000 admissions
1930 to 1936 ..	4	2	2	1	9	7,649	1.17
Average per year	0.57	0.28	0.28	0.14	1.28	1,092	1.17

2. *Annual variations*

The total annual medical admissions have gone up a little year by year—from 810 in 1930 to 1,278 in 1936—and the admission rate per 1,000 for acute rheumatic infection seems to be variable—no case in 1930–34, and 1935 had the maximum incidence of these infections.

The actual figures for the successive seven years are shown below in table II :—

TABLE II

Year	Medical admissions	Acute rheumatic infection per 1,000 admissions
1930	810	0
1931	1,171	0
1932	977	0
1933	1,069	0
1934	1,152	0.8
1935	1,192	6
1936	1,278	0

3. *Monthly incidence*

The distribution of these acute admissions for seven years, according to the month of admission, is shown in table III :—

TABLE III

	Acute rheumatic infection admissions	Climate	
April ..	0	Hot dry months	*Nil*
May ..	0		
June ..	0		
July ..	0	Hot damp months	7
August ..	0		
September	6		
October ..	1		
November	1	Cold dry months (Xmas rains)	2
December	1		
January ..	0		
February	0		
March ..	0		
TOTAL ..	9		9

TABLE IV

Years	Fever and poly-synovitis	Carditis	Chorea	Total	Per cent
0 to 5	0	0	0	0	0
5 to 10	1	2	0	3	33.3
10 to 15	2	2	1	5	35.3
15 to 20	0	0	0	0	..
20 to 25	0	0	0	0	..
25 to 30	1	0	0	1	11.3
30 to 35	0	0	0	0	..
35 to 40	0	0	0	0	..
40 to 45	0	0	0	0	..
45 to 50	0	0	0	0	..
50 to 55	0	0	0	0	..
TOTAL	4	4	1	9	100

4. *Age incidence*

The age distribution for acute rheumatic infection is set out in table IV :—

Figures, though small, indicate how 88 per cent of cases were admitted below 15 years of age and the age of these varied from 5 years to 15 years. One hundred per cent were below 30 years and not a single case over 30 years.

5. *Sex distribution*

All the nine cases of acute rheumatic infection were males. No case in females was admitted.

ADMISSIONS FOR CHRONIC RHEUMATIC MITRAL DISEASE

1. *Type incidence*

Table V shows the admission rate per 1,000 medical admissions :—

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TABLE V

1930 to 1936	WITHOUT HEART FAILURE				WITH HEART FAILURE			Grand total	Per milli medical admissions
	Stenosis only	Combined S and R	Regurgitation only	Total	Congestive heart failure only	Auricular fibrillation	Total		
Actuals ..	22	33	44	99	24	8	32	131	17.1
Per cent ..	22	33	44	..	75	25	..	..	..
Average per year	3	5	6	14	3	1	4	19	17.1

About one-third of the chronic mitral disease cases were without heart failure and about one-third with heart failure. In the former group there was valve defect of stenosis only in 22 per cent, of stenosis and regurgitation in 33 per cent, and regurgitation only in 44 per cent. In the heart-failure group, there is no record of cases with congestive heart failure and auricular fibrillation. Seventy-five per cent were of congestive heart failure and 25 per cent were of auricular fibrillation only.

There is an obvious difference, therefore, between the various figures obtained in this hospital and those in King George's. The striking difference seems to be in 44 per cent of cases being of mitral regurgitation and only 22 per cent of stenosis. I am inclined to think that stenosis alone or stenosis with regurgitation is a more frequent finding than regurgitation alone. Mitral diastolic murmur on which the stenotic lesion is diagnosed is very frequently missed and the classical crescendo, presystolic murmur, is comparatively rare—hence most cases are diagnosed only as mitral regurgitation.

2. *Monthly incidence*

The distribution of these heart-failure cases from primary chronic mitral valve disease according to the month of admission has been as follows :—

TABLE VI

Primary M. V. heart-failure cases			Average admissions, per month
April	4	Hot dry months	9
May	8		
June	15		
July	13	Hot damp months	9
August	9		
September	11		
October	4		
November	14	Cold dry months	10
December	4		
January	13		
February	15		
March	5		

More or less equal distribution of cases in various months.

3. *Age incidence*

Age incidence of the admission for primary chronic mitral valve disease, with or without heart failure, is set out in table VII :—

TABLE VII

Years	Number of cases	Per cent	
0 to 5	0	0	25
5 to 10	6	5	
10 to 15	25	20	
15 to 20	20	16	44
20 to 25	19	15	
25 to 30	17	13	
30 to 35	13	9	24
35 to 40	10	8	
40 to 45	9	7	
45 to 50	5	4	7
50 to 55	2	2	
55 to 60	1	1	
TOTAL	127	100	

Whereas 25 per cent were under 15 years, 69 were under 30, and 93 per cent were under 40 years of age. As will be seen from table IV, 88 per cent of cases of acute infection were admitted below 15 years, and it seems that the main incidence of heart failure and chronic mitral disease would fall between 20 and 30 years—the period required for these patients to seek admission from disabilities connected with circulatory failure.

4. *Sex distribution*

Of the 127 cases of chronic rheumatic heart disease, 16 were in females and 111 in males. It is well known how various social customs like 'purdah' in this country interfere with correct estimation of the distribution of a disease in the two sexes. Hence these figures cannot be deduced to give any idea of distribution of this condition in the two sexes.

Post-mortem rates

There were no post-mortem examinations done on acute rheumatic infections, but the results of post-mortem examinations in chronic

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rheumatic mitral diseases are summarized as follows :—

1. *Type distribution*

TABLE VIII

Chronic rheumatic mitral disease

Uncomplicated	With auricular fibrillation	With congestive heart failure
0	1	5

Total post-mortem examinations, 1930 to 1936. 118
Rheumatic heart disease, 1930 to 1936. 6
Percentage incidence 5.1

Only heart failure cases due to primary disease of mitral valve have been included. Heart failure due to other conditions like chronic bronchitis and emphysema, chronic myocardial disease or aortic disease has been excluded.

2. *Valve affected*

Of six mitral lesions, four were of pure stenosis and two of combined stenosis and regurgitation.

3. *Previous rheumatic history*

This was obtained in half of these cases.

4. *Sex and caste distribution*

All were Hindu males.

5. *Age distribution at death* is shown in table IX :—

TABLE IX

Years	0/5	6/10	11/15	16/20	21/25	26/30	31/35	36/40
Mitral heart-failure cases.	0	0	1	0	1	3	1	0

All died between 11 and 35 years. Maximum incidence of death was at 30 years.

Conclusions

The hospital records of cases and the post-mortem records have been analysed in the above pages, and it helps to throw light on some of the problems connected with rheumatic infection in Indians. The following conclusions may be drawn :—

(1) That acute rheumatic infection in India, with poly-synovitis, carditis and chorea, though rare in the hospital-going class of Indians, is a definite clinical entity to be seen in India.

(2) That the incidence of chronic rheumatic infection is far more common. For every case of acute rheumatic infection admitted in the hospital during the period under review, 14 cases of chronic valvular disease, mostly mitral and of undoubted rheumatic origin, sought admission :—

Acute rheumatic infections in 1930–36 = 9.

Chronic rheumatic infections in 1930–36 = 131.

(3) That one is justified in drawing the conclusion that the initial rheumatic infection in Indians is rarely fulminating and acute, and rarely compels the patient to seek medical advice in hospital and is probably of a slow, insidious course and onset—mostly vague pains in the body and joints, not severe enough to confine the patient to bed or to seek hospital admission.

(4) The most common age for acute rheumatic infection is between 5 and 15 years.

(5) The most common age when the patient seeks hospital aid from cardiac disabilities connected with chronic mitral valvular lesion is between 20 and 35 years of age—about 10 to 15 years after the initial infection.

(6) There is no definite distribution in the sex or caste of the patients, nor is the monthly admission of any great significance.

(7) Rheumatic nodules are very rare.

The clinical experience of physicians attached to the Thomason and Lady Lyall Hospitals in Agra. They have recorded their independent opinion, incorporating their experiences of private practice as well. The opinion seems to bear out the facts, in most cases, as revealed by the statistics above.

Note by Lieut.-Colonel J. C. Bharucha, I.M.S., Principal, Medical School, Agra, and Physician, Thomason Hospital, Agra :—

Cases of rheumatic fever of acute type, with poly-arthritis, fever and responding to salicylates are seen amongst the well-to-do class of people in private practice. I have seen about half a dozen cases of this type, mostly in boys and girls of school-going age—and at least in two of them I could see the developing mitral lesion —but such cases have not come under my observation in hospital practice, quite likely because the majority of such patients are either not ill enough to seek hospital admission in a big city, or they are treated by other systems of indigenous medicine.

On the other hand, we do get a fairly large number of cases seeking admission into the hospital for failure of compensation, and showing mostly mitral lesions, either stenosis only or both stenosis and regurgitation, and most of them give a history of pains in the joints. As such types of cases come up in hospital practice, I have no doubt that rheumatic fever, if not of a very acute type, does occur in India. It is likely that its onset is insidious and the course not so fulminating as in the West. I have seen one case of rheumatic nodules, coming on in a case of mitral disease, when the failure of compensation set in. It is likely that these nodules were an evidence of increased activity of the underlying rheumatic process leading to

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a failure of compensation. I have seen one or two cases of chorea in young girls.

Note by Dr. S. Chaudhuri, W.M.S., Lecturer in Medicine and Physician, Lady Lyall Hospital, Women's Medical School, Agra :—

After nine years of experience in the women's hospitals in Delhi and Agra, I have come to the conclusion that rheumatic infection is far from uncommon in India. It seems to take on a sub-acute and insidious onset and course and thus 'rheumatic fever' frequently remains undiagnosed until the patient is forced to seek medical advice for some form of cardiac disability precipitated by pregnancy or reactivation of disease.

I have seen six cases of acute rheumatic fever which had poly-arthritis and high temperature; three of these showed choreiform movements, none showed any rheumatic nodules and they all responded to salicylates. I have at present in the medical unit of the Lady Lyall Hospital, Agra, a case, 30 years of age, with a fulminating form of acute rheumatic fever—continuous high temperature, of acute poly-arthritis, choreiform movements localized to one arm, leucocytosis, a very high sedimentation rate (100 mm. at the end of one hour by Westergreen's technique), and responding very well to large doses of salicylates. No rheumatic nodules are seen.

On the other hand, I have seen a larger number of cases of chronic valvular disease of the heart, mostly mitral endocarditis with or without congestive heart failure; a good percentage of these cases showed auricular fibrillation. I have seen a few cases of hemiplegia of embolic origin with mitral disease and one case of mitral disease ending fatally after sub-acute bacterial endocarditis, confirmed at the post-mortem table. In most of these cases one could obtain, on careful and searching enquiry, a previous history of attacks of joint pains or vague aches and pains with fever dating from early childhood. I have absolutely no doubt in my mind that almost all of these cases were frankly rheumatic in origin.

The following table gives the actual admissions to the Lady Lyall Women's Hospital, Agra, for the past three years :—

	1934	1935	1936
Total medical admissions.	3,433	3,616	3,685
Mitral disease ..	4	6	4
Congestive heart failure.	4	10	6
Auricular fibrillation.	1	0	0

Note by Dr. G. N. Vyas, M.D., M.R.C.P. (Edin.), for over 10 years Lecturer of Medicine and Physician, Thomason Hospital, Medical School, Agra :—

It can be freely stated in general terms that rheumatism in all its forms is less common in

(*Continued at foot of next column*)

THE SUBCUTANEOUS NODULE OF RHEUMATISM

By P. G. GOLLERKERI, M.D.

(*From the Departments of Pathology, Medical College and General Hospital, Rangoon*)

THE rheumatic infective agent has been observed to attack particularly fibrous connective tissues of certain parts of the body. The myocardium gets the lion's share of the attention in the young, and the connective tissue around the joints and at muscle and tendon

(*Continued from previous column*)

India than in European countries, particularly in Great Britain.

The standing points of interest regarding the types prevailing in India are as follows :—

(1) Acute and flagrantly-active phases of the disease are conspicuously rare. Thus Sydenham's chorea, rheumatic nodules, acute rheumatic fever with poly-synovitis and acute rheumatic endocarditis are not so often met with in clinical and hospital practice in India as in England. But the existence of each of these forms is decidedly beyond challenge.

(2) The type of rheumatism that commonly prevails in this country is a mild and chronic form with ill-defined and vague pains in joints and tendons. It is not at all uncommon to find a negative history of rheumatism in a frankly rheumatic case of mitral stenosis.

(3) Valvular diseases of the heart of rheumatic origin are fairly common when compared with the rarity of other manifestations of rheumatism. The lesions in all probability are due to previous chronic rheumatic endocarditis. The common valvular lesions arranged in the order of their frequency are :—

(1) Mitral stenosis and regurgitation (double mitral).
(2) Mitral regurgitation.
(3) Mitral stenosis (pure stenosis is somewhat rare).
(4) Extensive mitral stenosis and regurgitation with slight aortic regurgitation.
(5) Double mitral as well as double aortic lesions.

(4) Arthritic manifestations are more conspicuous in adults than in children.

(5) Pericardial involvement occurs in a very small proportion of cases.

(6) Preponderance of males over females is delusive owing to the deterrent effect of purdah on hospital admissions.

(7) The age incidence conforms to the European type. Most of the manifestations occur in the rheumatic period of life, *i.e.*, 10 to 35 years.

(8) The association of infected tonsils with valvular damage is too common to be ignored as an ætiological factor of importance.

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attachments in the older subject. Serous membranes like the pericardium and synovial membranes are also liable to be attacked. No matter where the focus is localized, the history of an active lesion is described as fairly characteristic, just as is the structure of a tuberculous focus. The chief feature of the rheumatic process histologically is a proliferative phenomenon with a small degree of degeneration or necrosis which may or may not be recognizable. An exudative factor may accompany this proliferative lesion, specially in connection with the affection of the serous membranes or when the lesion is superficially situated.

In muscular rheumatism, the lesion may tend to be localized near the attachment of the muscle to the bone rather than the belly. Thus, ends of bones, long or otherwise, are especially vulnerable points for the activity of the rheumatic virus. Again, as the muscle gets attached to its bone, it comes to lie, when it approaches the bone, more superficially in relation to the skin above. This adds to the possibility of the lesion becoming infected with staphylococci from the skin surface. The staphylococcal infection is a feature of great importance as it may confuse the true underlying cause and nature of the lesion, when the histological structure comes to be studied.

Acute rheumatism, particularly in the child and young adult, is said to be accompanied by erythematous nodules over bony prominences near the large joints of the extremities. These, though not specific to rheumatism and occasionally met with in tuberculosis, are superficially situated, cutaneous rather than subcutaneous.

In the course of the last three years, four subcutaneous subacute lesions attracted attention because of a similarity of their histological structure to the classical picture of the Aschoff bodies. None of these four cases, however, gave a definite history of joint pains of a rheumatic nature nor clinically showed a rheumatic heart lesion. But the anatomical situation of these four lesions and the duration of three of them pointed to their rheumatic nature.

Before proceeding to report these four cases, a brief histological description of a true rheumatic lesion would not be out of place.

The Aschoff body is the result of proliferation of certain kinds of inflammatory cells with a varying degree of exudative element added. At first, there is a degenerative change in the collagen of the part affected (fibrinoid degeneration of Klinge) which may or may not be visible after the subsequent proliferative phenomenon. The proliferation is para-vascular in distribution, being situated in relation to the adventitia of the small arteries, but it is at one side of the vessel and does not surround it. The architecture of an Aschoff body has in it the following four components :—

(1) Centre of necrotic (or degenerated-Klinge's fibrinoid degeneration) material which may not be visible.

(2) Aschoff cells. Large epithelioid type of cells showing one or more nuclei and basophile-staining cytoplasm. These giant cells are probably the result of the exudative element of the process, with swelling and œdema of the cells.

(3) Lymphocytes and plasma cells and occasionally polymorphonuclears. The last may be so numerous as to swamp the characteristic architecture of the whole structure. This is particularly true when the serous membranes are attacked and in the superficial lesions about to be described.

(4) Fibroblastic proliferation with subsequent fibrosis.

Subcutaneous nodules have been described in the acute rheumatic conditions of children and adolescents, as well as in the chronic rheumatoid conditions of adults. Klinge believes in the identity of the histological picture of these two conditions, though recently Collins (1937) disputes it after a very careful study of nine cases. Of the four cases about to be cited, if only age is taken into account, case 4 (52 years) may fall into the rheumatoid group with possibly case 1 (39 years). The ages of the other two would put them definitely in the rheumatic class. Thus, with a similar histological picture of the lesions, it corroborates Klinge's observation. In none of the four cases was there a definite history of trauma preceding the development of the lesion.

Case 1.—Burman male, 39 years, admitted into hospital for an inflamed tender swelling on the side of the left shoulder blade. It became acutely painful about two and a half weeks prior to admission. The swelling is of two years' duration and varied in size during this period. There was no past history of fever and joint pains. Wassermann reaction—negative. Physical examination of the various systems—normal.

Operation report.—A deep subcutaneous localized abscess definitely circumscribed and surrounded by a very fibrous capsule. Culture from the pus showed *Staphylococcus aureus*. Clinical diagnosis: tuberculous process with secondary infection. Tissue sent for a histological examination.

Histological report.—Sections suggestive of an acute exacerbation of a subacute inflammatory process of the subcutaneous region. Superficially, the cells are mostly of the neutrophile polymorphic variety with here and there a mononuclear tissue cell or a giant cell. Deeper down towards the fibrous capsule the cell infiltration is mainly that of mononuclear round cells, plasma cells and giant cells, the last being both of the mono- and multi-nucleated varieties. There is a good deal of capillary proliferation and the cell infiltration is particularly grouped about the lumina of these. Then follows the thick fibrous wall with an irregularly disposed adipose tissue (subcutaneous) in and around it. The structure is therefore suggestive of a subcutaneous rheumatic process with acute exacerbation by a staphylococcal infection.

Case 2.—Burmese female, 18 years, admitted into hospital for treatment of a swelling at the lower end of the right thigh and the knee joint of one year's duration. It is hot to the feel and seems to be attached to the joint. It is soft and free from the skin. The pain is worse at night and there is heaviness on that side when walking. Teeth and gums—bad. No anæmia. *X*-ray examination—no bony lesion. Urine—negative findings.

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Operation.—Tumour opened up and rusty fluid let out. Part of tumour sent for histological examination.

Histological report.—Sections show a vascular and loose connective tissue with a subacute inflammatory cell infiltration. The cells are particularly numerous around the vessel lumina. Mostly there are mononuclear round cells of the lymphocyte variety with a good sprinkling of plasma cells. There are no multinucleated giant cells, though here and there are seen a few larger epithelioid cells. The rest (greater part) is made up of thick fibrous tissue.

Case 3.—Hindu male, 25 years. Soft suppurating tumours occupying the greater part of the upper half of the back on either side of the spine. Duration two years. ? caries spine.

X-ray examination—no bony lesion demonstrable.

Histological report.—Suppuration in a subacute inflammatory process in thick fibrous connective tissue. The cell infiltration is more marked towards the cavity of the abscess. The polymorphonuclears preponderate, but towards the wall the cell types vary and are more numerous and closely packed. Vascularity increases as one approaches the fixed tissue and the cells seem to group round the lumen of the vessels. Discrete masses of calcified matter are also seen in this region. The cells are of the small round lymphoid variety, plasma cells and uni- and multi-nucleated giant cells of the Aschoff type.

The structure is not suggestive of a tuberculous process, nor could it be regarded as syphilitic.

Case 4.—Chinese male, 52 years, was admitted for the treatment of a painful swelling of the right arm of two months' duration. It started with fever followed by an indurated swelling on the lateral aspect of the middle of the right arm. He was given an intramuscular injection in the gluteal region outside the hospital and, not finding any relief from it, sought admission into hospital.

Operation.—Same day as admission. A cyst-like tumour containing blood-stained fluid was noted. A part of the cyst (?) wall was sent for section.

Section report.—The tissue received was in many small pieces, all of these were sectioned in one block. Histologically, they all show a fairly vascular granulation tissue of a loose texture, with a pleomorphic cell infiltration suggestive of a subacute inflammatory process. Mononuclear round cells, plasma cells and fibroblasts are seen irregularly mixed together between the capillaries. Among these, large uni-nucleated cells with a pink-staining cytoplasm are seen in some numbers. The nucleus of these large cells is not prominent and in some not seen at all. Multi-nucleated giant cells are not seen. The number of polymorphonuclears is very small. There is no proliferation of the epithelioid type of cell nor is there any noticeable thickening of the vessels. The looseness of the tissue in which this cell-infiltration and granulation tissue is developing suggests it to be a kind of degeneration of the collagen (fibrinoid degeneration of Klinge). It is not suggestive of a tuberculous process nor could it be a syphilitic condition. The histological picture and location of the lesion in the neighbourhood of an important joint, where powerful muscles get their attachment, suggest a rheumatic origin for the condition.

Discussion.—Clinically rheumatic processes are recognized by their specific activity in the heart in the young and the joints and muscles in the adult. General systemic reaction in the form of fever, pain and swelling of joints tends to be more marked in children and young adults than in elderly people. The histological changes associated with true rheumatic lesions —the Aschoff nodules—can be found, not only in the myocardium but also in other tissues, such as the blood vessels, the connective-tissue sheath of the tendons and aponeurosis and the synovial membrane of subjects dying of rheumatic fever. The Aschoff nodule, although considered as specific histological evidence of rheumatic fever, may nevertheless turn out to be a peculiar non-specific reaction to the streptococcus occurring in the tissues of certain people, as similar bodies have been found in the heart muscle in cases of scarlet fever. The changes in the muscle and peri-articular tissues are, according to Swift, Klinge and Coombes, localized manifestations of a general reaction of the body to various infecting organisms rather than to one particular organism.

None of the four cases described above gave any history of articular rheumatism nor were there any stigmata of a rheumatic diathesis. Except in case 1, the teeth of all of them were described as 'bad'. In many cases of true rheumatism a focus of probable absorption is generally available in the mouth. Tonsillitis and sore throats come to be looked for as a routine in the clinical examination of patients complaining of rheumatic joint and heart lesions. There is some definite relationship between the finding of the streptococcus in the tonsils and throats and the development of the joint or heart manifestations. Arthritis in older people is so often associated with pyorrhœa that the connection cannot be overlooked. Pyorrhœa is a condition from which a heterogenous mass of pathogenic and saprophytic organisms can usually be isolated. Of the former the streptococcus is the most common and is almost invariably found. Again in about 8 per cent of rheumatic fevers the streptococcus has been cultured from the blood. Whether the streptococcus has been recovered from the tonsil, the throat or from bad teeth, it seems to have a definite relation to the development of lesions in the connective tissues around joints, muscles, etc. Usually the lesions are near enough to a joint to produce subjective symptoms referable to the joint itself. But if the lesion is some distance from the joint so as to be localized as a definite inflammatory focus, the true underlying cause may be lost sight of, as has probably occurred in these cases. Again, these nodular lesions may be the only manifestation of a rheumatic infection.

The long duration and the chronicity of these lesions may suggest to the clinician one of the two other common infections as the possible cause—tuberculosis and syphilis. The histology of a tuberculous process is so straightforward and definite that none but a tyro in histological diagnosis would miss it. On the other hand, syphilitic lesions are not so definite histologically. In the cell infiltration of an active syphilitic lesion, one goes by the presence of mononuclear round and plasma cells with their characteristic concentric distribution round the vessel. There is a varying degree of fibrosis and a few epithelioid cells. Giant cells of any kind are rare. But an invariable feature of syphilitic processes is the marked peri-arterial thickening

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BACTERIOPHAGE TREATMENT OF DYSENTERY IN PRIVATE PRACTICE

By M. O'CONNOR, M.B., B.S. (Lond.), M.R.C.S., L.R.C.P.
Calcutta

IT is important at the outset of this article to emphasize the point that it only contains an account of the use in the treatment of dysentery of bacteriophage, which the writer has found effective, and that it is not, in any way, a truly scientific treatise presenting full bacteriological and clinical data. The general principles of treatment are given, and in many cases the diagnosis is only made on the presence of mucus, blood and pus seen in the stool with the naked eye.

In private practice the financial circumstances of the patient may not always permit of a full bacteriological examination of the stool. Also a full bacteriological examination of a stool, with identification of the organism, takes two valuable days. Some of the cases treated may not have been botanical dysenteries and certainly some later proved clinically and under the microscope to be amœbic. In those reported on, Flexner infections were by far the most common, and certainly the easiest to cure. Shiga infections were more resistant. Culture reports after phage treatment are confusing and, in my opinion, of little value.

Incidentally an amœbic infection was often found in cases apparently cured by this phage treatment and one was given the impression that, in many cases, it required an added bacterial or chemical irritation to activate the *Entamœba histolytica*. Cases of amœbic hepatitis frequently had no present nor previous history of bowel infection, except of a dysentery cured by phage treatment four or five years previously. This raises a question outside the scope of the present article.

The bacteriophage used has generally been that prepared by the Pasteur Institute in Shillong, but since this is not generally available to chemists in Calcutta, occasionally the French product, sponsored by d'Herelle, was used. The latter is more expensive, but equally effective.

I would like first to outline a more or less standardized treatment of dysentery with bacteriophage, and later to proceed with the discussion of the various features, my reasons for their inclusion, and which, in my view, account for the success of the treatment.

Diagnosis.—As already stated, a diagnosis of dysentery is made essentially on the discovery of mucus, blood and pus in the stool, together with a history of frequent stools. Pain, fever and acute onset may or may not be present. There may be a history of an acute attack of gastro-enteritis, *viz,* diarrhœa and vomiting several days previously, which has been relieved by sedatives. Examination of the patient may show a rise of temperature, or in the less acute cases a subnormal one. There is usually some abdominal tenderness, general in acute cases, and in the writer's experience more commonly left-sided in bacillary cases and cæcal in amœbic ones. In children it is well to keep in mind the possibility of intussusception.

If possible send, or arrange to be sent, a fresh specimen of the stool to a pathologist. If the patient has walked into my consulting room and is not acutely ill, I usually send him to the laboratory to pass a fresh stool, so that my colleagues may have every chance of finding amœbæ if they are present.

Treatment.—The patient is sent to bed, and presented with two sheets of paper, one the prescription for the chemist and the other full instructions concerning his diet and treatment.

The first reads as follows :—

℞

(*i*) Sodii bicarbonatis .. 1 oz.

* * * * *

℞

(*ii*) Bacteriophage (Shillong) one box.

* * * * *

℞

(*iii*) Sodii sulphatis	..	ʒi
Magnesii sulphatis	..	ʒi
Tincturæ belladonnæ	..	♏v
Tincturæ cardamatis co.	..	♏xv
Glycerini ..	..	ʒi
Aquam ..	..	ad ʒi

Mitte ʒvi

Sig.

'The red mixture'.

(*Continued from previous page*)

with hyalinization noticed in the small vessels. This thickening which may be so great as to strangle the lumen of the vessel, together with the cell infiltration above described, has proved time and again in our hands to be syphilitic and corroborated by a subsequent Wassermann reaction of the blood.

Thus, we are left with the strong possibility of these lesions being of a rheumatic nature without the occurrence of the usual phenomena of joint and heart affections.

Summary.—Four subcutaneous nodules are described with reference to their clinical and histological appearance. They have a similarity to rheumatic subcutaneous nodules in their histological structure and localization. In none of the cases, however, was a clinical history of rheumatism, recent or remote, obtainable, nor were any physical signs of a rheumatic nature discoverable. The question of their being an independent manifestation of rheumatic infection is discussed.

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Collins, D. H. (1937). *Journ. Path. and Bact.*, Vol. XLV, p. 97.

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Take two tablespoonfuls as directed, followed by a large glass of water.

* * * * *

℞

(*iv*) Kaylene .. .. 2 oz.

Sig.

Label.

The second sheet of instructions is written out fully in every case, for example :—

To-day.

Take a dose of the red medicine (*iii*), followed by a large glass of water.

One hour later take another dose.

One hour later take two teaspoonfuls of Kaylene in half a glass of water and repeat every two hours until the pain ceases.

Continue during the night if necessary.

Diet.

Clear soup, Bovril or Brand's essence, tea, orange juice, malted milk and perhaps an egg-flip in the evening.

To-morrow.

On waking (or better state a time, say)

7 a.m. Take a level small teaspoonful of bicarbonate of soda in half a glass of water.

7-5 a.m. Take the contents of one tube of bacteriophage in half a glass of water.

7-30 a.m. Take another tube of phage.

8 a.m. Take another tube of phage.

8-30 a.m. Take another tube.

9 a.m. Take another tube.

Wait for *one hour* before taking *anything* else except plain boiled water.

Then take an egg-flip (one egg beaten up in a glass of boiled milk or Horlick's, to which a teaspoonful of sugar may be added). No alcohol.

Diet.

As for yesterday, *plus* clear, strained soup, plain packet or calves-foot jelly. Egg custard. A little toast or cream cracker biscuits.

Save the last stool for the doctor.

One usually sees the patient first in the earlier half of the day, and, if so, it is valuable to see him again in the evening. If the symptoms are severe a plain saline bowel wash of three pints is given, and half an hour later—when the bowel has had time to settle down—the contents of five tubes of bacteriophage in ten ounces of water are run in slowly per rectum and the patient instructed to retain it as long as possible.

Only in infants do I think it worth while giving phage on the first day by mouth.

The patient is seen on the second day, if convenient, in the middle of the day, namely after the phage treatment has been completed. There is usually an early morning stool to be seen, but quite commonly no stool is passed after two or three doses of phage have been taken. Each stool is passed into a receptacle which is emptied before another is passed; in this way the physician is able to see the last stool.

The symptoms are usually relieved after the phage administration and instructions are given for the taking of one dose of the 'red medicine' on waking on the following day, and that the stool be saved.

Thus the patient is again seen on the third day, advisably early in the morning so that the stool does not have to be kept any longer than necessary. This stool is commonly free from any visible blood, pus, or even mucus, in which case the diet may be materially increased to include boiled fish, eggs cooked in any manner, fruit fools, mashed and sieved vegetables and soft puddings, *i.e.*, practically a residue-free diet. Also instructions are given that on the next day (the fourth day of treatment) three doses of phage are to be taken after bicarbonate of soda exactly on the same scheme as before, *i.e.*, bicarbonate on a night-long empty stomach and no food until one hour after the last phage.

If there is still blood and mucus on the second and third days I usually continue the Kaylene three or four times daily, one hour before food. The diet is not increased and on the fourth day a complete course of five doses of phage is repeated instead of three.

On the fifth day the saline mixture is repeated first thing in the morning, as, when the phage is effective, constipation is the usual rule.

The patient may be allowed to report on this stool himself, if the course of the case has been 'normal'. He is instructed to report any kind of relapse and to watch his stools for a further week.

If there is persistence of blood and mucus after the second course of phage, a fresh stool should certainly be sent for examination—if the case has not already been reported as one of amœbiasis.

Discussion

It will be noticed that the principle of this treatment is first the flushing out of the bowel with a saline purge, followed by the administration of bacteriophage in successive doses into the washed bowel, after ensuring that the normal acidity of the stomach has been neutralized. Another important point is that the patient is allowed more food than is usual.

Let me take the points in treatment as they arise.

I would emphasize the necessity of writing down fully all instructions. The time table is very useful as the patient can check off each dose as it is taken. He does not have to depend upon his memory and is protected from the interference of solicitous friends.

The 'red mixture' is designed to give a maximum flushing action carrying the water through the bowel and producing a flow of lymph into the bowel.

If phage is as effective as it is said to be, why not give it at once? My answer to this is, simply, it does not work so well. I have been using this treatment for some six or seven years

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and have come to the conclusion that I cannot gain anything that first day by administering the phage on an unwashed bowel. Even if I have seen the patient early in the morning or he has had no food for eight or more hours I have found that I only get my maximum phage action after the administration of a dose of salts, or the washing out of the bowel. One gets the impression that the action of the phage is lost on being absorbed into intestinal debris. Kaolin does not seem to affect its activity.

Often the patient is passing small blobs of blood and mucus when first seen and it is not until salts are administered that the bowel's fæcal contents are removed.

The phage is given in successive doses over a period of two hours in an attempt to ensure its contact with the whole of the affected bowel. There can be no doubt of the action of phage *in vitro*, and my approach to the question has been through considering it as a frail stuff easily destroyed and lost. It is fortunate that there appears to be no limit to the amount that may be administered. The only untoward symptom that I have met was a sensation of dizziness complained of by one nervous female patient. It normally produces a hungry empty feeling, almost pleasant.

In infants, where the diet contains practically no roughage, I find I can begin the phage treatment on the first day, and give one tube in a tablespoonful of water one hour before each four-hourly feed, starting three hours after a dose of milk of magnesia. The magnesia is repeated at night and five doses of phage given in the early morning as described, but at fifteen-minute intervals. The first-day feeds are of whey, albumin or glucose water and after the full morning phage treatment has been taken a fuller diet of skimmed milk or Sprulac is allowed. A small rectal wash with rectal phage is very useful at the beginning of a severe case.

The diet throughout is designed to limit residue, and carbohydrates are restricted, but allowed in sufficient amount to avoid acidosis. I am sure that it is important to maintain the strength of the patient and thereby increase his resistance, and feel that this is particularly true of infants. It is very gratifying to find that one has steered an infant through a severe Flexner infection without any loss of weight at the next weekly weighing.

One further point I would like to emphasize is that if bacteriophage, given as described, does not produce a cure after the second course, definitely suspect an amœbic infection.

In conclusion, the essential points of the scheme of treatment may be summarized thus:—

(1) A clean bowel.

(2) Massive phage dosage to ensure contact with the bowel.

(3) Residue-less diet to maintain strength.

(4) Ensuring that the patient understands and carries out the details of the treatment.

(Continued at foot of next column)

HERPES ZOSTER

EXPERIMENTS WITH TISSUE LYSATE AS A THERAPEUTIC AGENT

By P. A. MAPLESTONE, D.S.O., D.SC., M.B., Ch.B., D.T.M.
and
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HERPES ZOSTER is characterized by pain and the appearance on the skin of groups of vesicles on an erythematous base along the distribution of nerves from one or more posterior root ganglia. From the ætiological point of view it will suffice to state that the causative organism is a filter-passing virus. This has been definitely confirmed by animal inoculations. Herpes zoster is an important disease from the public health point of view, the causative organism being identical with, or very closely allied to, the virus of chicken-pox and epidemic encephalitis. Instances are not rare where exposures to infection of herpes have been the only possible source of an epidemic of chicken-pox in the family.

Not only is herpes zoster a very painful disease during all its stages, but when the Gasserian ganglion is affected it may involve the eye and it has been responsible for the loss of many eyes. Herpes in the ear is very acutely painful and sometimes causes impairment of hearing.

Immunity.—Much work has been done with the object of producing immunity. The disease has been produced experimentally in laboratory animals and in chicken embryos. Killed virus from these experimental animals is said to confer a certain amount of immunity on lower animals and men. Serum from convalescent patients has been successfully used to protect human beings from herpes and chicken-pox.

Therapeutics.—Various forms of treatment have been advocated, some to relieve the severe pain, and some to diminish the period of suffering or to prevent complications. Sodium iodide by mouth, pituitary extract injections, ultra-violet ray therapy, etc., have been tried without much benefit.

Treatment with killed virus.—We have treated 40 cases with injections of killed virus obtained direct from the herpetic lesions and used in the form of a tissue lysate, the preparation of which is described below. The results have been uniformly successful.

We claim that the killed virus, as we have used it, not only cuts down the duration of the disease but also relieves the pain after the first

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It is only fair to add that most of the points in this treatment were evolved as a result of discussion on bacteriophage with Colonel Morison when he was at the Pasteur Institute in Shillong.

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or second injection, and in no case was there any complication from the disease. Altogether two or three injections are required to complete the course of treatment and it takes only one week. The technique of preparing the tissue lysate is a simple one and can be carried out in any bacteriological laboratory.

The question now arises as to the practical application of the therapy in general practice. and ether in equal parts. With a pair of sharp scissors, curved on the flat, two or three vesicles are removed carefully so that no normal tissue is included in the portion cut off. A known weight (20 mgm. are generally taken) of the tissue is ground up in a sterile agate mortar with sterile pumice-stone powder until it forms a uniform emulsion with sterile normal saline solution. The amount of saline used for 20

TABLE

Protocols of cases treated and cured by injection of tissue lysate

Serial number	Caste	Sex	Age	Duration of disease	Amount of material injected, in cubic centimetres	Interval between the injection in days
1	H.	M. Ch.	12	3 days	0.2, 0.2, 0.3, 0.2	Alternate days.
2	H.	F.	22	8 ,,	0.1, 0.2, 0.3, 0.4	Twice weekly.
3	H.	M.	44	5 ,,	0.2, 0.3, 0.4, 0.4	Alternate days.
4	H.	M.	40	10 ,,	0.2, 0.4, 0.4	1 week.
5	H.	M.	40	6 ,,	0.1, 0.2, 0.4, 0.4	First 2 injections bi-weekly and then weekly.
6	H.	M.	28	6 ,,	0.1, 0.2	Alternate days.
7	H.	M.	24	3 ,,	0.2, 0.4, 0.4	2 days.
8	O.C.	M.	56	5 weeks	0.2, 0.4, 0.5	Twice weekly.
9	H.	M.	28	7 days	0.1, 0.2	4 days.
10	M.	M.	45	2 ,,	0.1, 0.2	Alternate days.
11	H.	M.	28	5 ,,	0.2, 0.4	1 day.
12	H.	M.	24	1 week	0.2, 0.4	4 days.
13	H.	M. Ch.	10	1 ,,	0.1, 0.2	4 ,,
14	H.	M.	22	2 days	0.1, 0.2	3 ,,
15	M.	M.	45	5 ,,	0.1, 0.2	15 ,,
16	H.	M.	14	2 ,,	0.2, 0.2, 0.2	3 ,,
17	H.	M.	42	6 ,,	0.1, 0.2, 0.3	2 to 3 days.
18	M.	F.	30	2 ,,	0.1, 0.2	3 days.
19	H.	M.	19	6 ,,	0.1, 0.2	4 ,,
20	H.	M.	34	6 ,,	0.2, 0.3, 0.4	3 ,,
21	H.	M.	14	7 ,,	0.2, 0.2	3 ,,
22	M.	M.	38	1 week	0.2, 0.3	3 ,,
23	H.	M.	30	4 days	0.1	....
24	M.	F. Ch.	5	4 ,,	0.1, 0.2	2 days.
25	H.	M.	37	6 ,,	0.1, 0.2	2 ,,
26	H.	M.	25	3 ,,	0.2, 0.2, 0.2	Alternate days.
27	H.	F.	17	2 ,,	0.2, 0.2	,, ,,
28	H.	F.	15	4 ,,	0.2, 0.2	,, ,,
29	E.	F.	36	3 ,,	0.2, 0.2, 0.2	,, ,,
30	H.	M.	28	2 ,,	0.2, 0.2	,, ,,
31	H.	M.	27	1 week	0.2	....
32	H.	F.	35	5 days	0.2	....
33	H.	M.	21	4 ,,	0.2	....
34	H.	M.	14	1 week	0.2	....
35	H.	M.	22	1 ,,	0.2	....
36	M.	F.	70	5 days	0.2	....
37	H.	M.	20	1 week	0.2	....
38	H.	M.	30	3 days	0.2	....
39	H.	F.	45	2 ,,	0.2	....
40	H.	M.	60	4 ,,	0.2	....

Footnote.—(1) Some of the early cases, cases 1, 2, 3 and 5, had four injections but it was soon found that two to three injections were sufficient.

(2) Cases 31 to 40 were given only one injection each. All of them improved so rapidly that no further injections were necessary.

The possibilities are not remote and the difficulties are not many to overcome in order to make the killed virus available to practitioners. As previously stated, the disease has been produced in laboratory animals, and chicken embryos take the infection. From these sources there need be no dearth in the supply of virus.

Preparation of tissue lysate.—A few herpetic vesicles are sterilized by application of alcohol mgm. of tissue is 20 c.cm. This mixture is then filtered, first through a Kieselghur filter and afterwards through Chamberland candle No. L3 under negative pressure. (A water pump costing about Re. 1-8 will produce sufficient negative pressure for this purpose.) To the filtrate add an equal quantity of normal saline containing 0.2 per cent of commercial formaldehyde.

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REGIONAL ILEITIS

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REGIONAL ILEITIS is a disease discovered very recently and the pathological conditions due to this disease were treated as malignant, tuberculous or even actinomycotic.

In 1932 Crohn, Ginzburg and Oppenheimer, segregated from the miscellaneous group of benign granulomas a necrotizing and cicatrizing inflammation, confined to the terminal ileum, which they believed to be a pathological entity and called it regional ileitis. Crohn also described the condition and classified it into four groups. In the early stages the symptoms resemble those of appendicitis to such an extent that innocent appendices are often removed, while the real source of discomfort is overlooked.

This is a disease pre-eminently of young adults, and runs a very chronic course. This condition is found not only in the ileum, but also in the other parts of the small bowel and the large intestine. But in the majority of cases, the disease begins at the ileo-cæcal valve and spreads to the lower portion of the ileum. The disease described as 'non-specific granuloma of the ileo-cæcal region' is identical with regional ileitis.

Ætiology

The ætiology is very obscure. The appendix has been held responsible by Hormans. He maintains that the vascular relations of the appendix are more favourable to ileal than to cæcal involvement. It is possible that some peculiarity of the anatomy of the terminal ileum, its mesentery and its blood supply, may predispose toward the development of chronic granulomatous inflammation in this region. The arrangement which would permit of the twisting angulation, and partial intermittent intussusception, or volvulus, has been considered by Crohn, Ginzburg and Oppenheimer as a factor which plays an important rôle in the disturbance of vascular mechanism which later on leads to the development of non-specific granuloma. They refer particularly to the repeated and self-reducing intussusception or recurrent partial volvulus at the ileo-cæcal valve, and emphasize the inability of differentiating in the end stages granulomatous lesions due to primary vascular insufficiency from those due to primary infectious agents. The abrupt cessation of the primary inflammatory process, giving rise to an organic stricture at the ileo-cæcal valve in many cases, could be explained on the basis of recurring self-reducing intussusception. According to Batson, the ascending branch of the ileo-cæcal artery which supplies the cæcum is more or less fixed in most cases, whereas the terminal branch of the same artery which supplies the terminal segment is capable of considerable rotation. It is conceivable that an unusual mobility of the terminal ileal segment might, by pinching or twisting the terminal branch of this artery, tend to devitalize the part in much the same way as an intussusception. As the disease seems most advanced at the ileo-cæcal valve, primary neuromuscular abnormality here might act as a predisposing factor inducing ileal stasis, infection, infiltration, and finally obstruction. The lymphangitis and surrounding inflammation, in chronic inflammatory lesions of the appendix, might encroach upon and infect the blood supply, and in this way slowly devitalize this segment of ileum, producing a lesion like that of terminal ileitis.

Pathology

In the fully developed case the 10 to 12 of the terminal inches of the ileum ending at the ileo-cæcal valve are thick, boggy and œdematous. The serosa is of a blotchy red colour and the mesentery of the involved segment is thickened and fibrotic and contains numerous enlarged glands. The lesion apparently begins at the ileo-cæcal valve and gradually tapers off as it ascends the ileum proximally. Oval mucosal ulcers about one centimetre in diameter are found in some cases occupying the long axis

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This is then put into a rubber-capped sterile phial and tested for sterility, and if found free from bacterial contamination it is ready for use. The resultant dilution comes to 2 c.cm. per mg. of the diseased tissue. The initial dose for an adult is 0.1 to 0.2 c.cm., and it is not necessary to increase the dose beyond 0.2 c.cm. Injections are given intradermally every other day or every third day. Usually only two or three injections are required for a full course of treatment.

Summary

Herpes zoster is an important disease from the public health point of view as the causative organism is identical with, or very closely allied to, the virus of chicken-pox and epidemic encephalitis. It is a very painful disease. It is responsible for the loss of many eyes when it affects the ophthalmic branch of the 5th nerve. Much work has been done from the immunological point of view. Various forms of treatment have been tried but none with much benefit.

Forty cases have been treated with intradermal injections of tissue lysate prepared from the herpetic vesicles and the results have been uniformly successful in relieving the pain and cutting down the duration of the disease. The technique of preparation of tissue lysate is simple and it would be possible to prepare it on a commercial scale.

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Fig. 1.—*Case* 1. Loop of the ileum inflamed and congested, with enlargement of the mesenteric glands. The local appearance and the clinical symptoms tallied exactly with the first of the four groups, into which Crohn has divided the clinical types in regional ileitis.

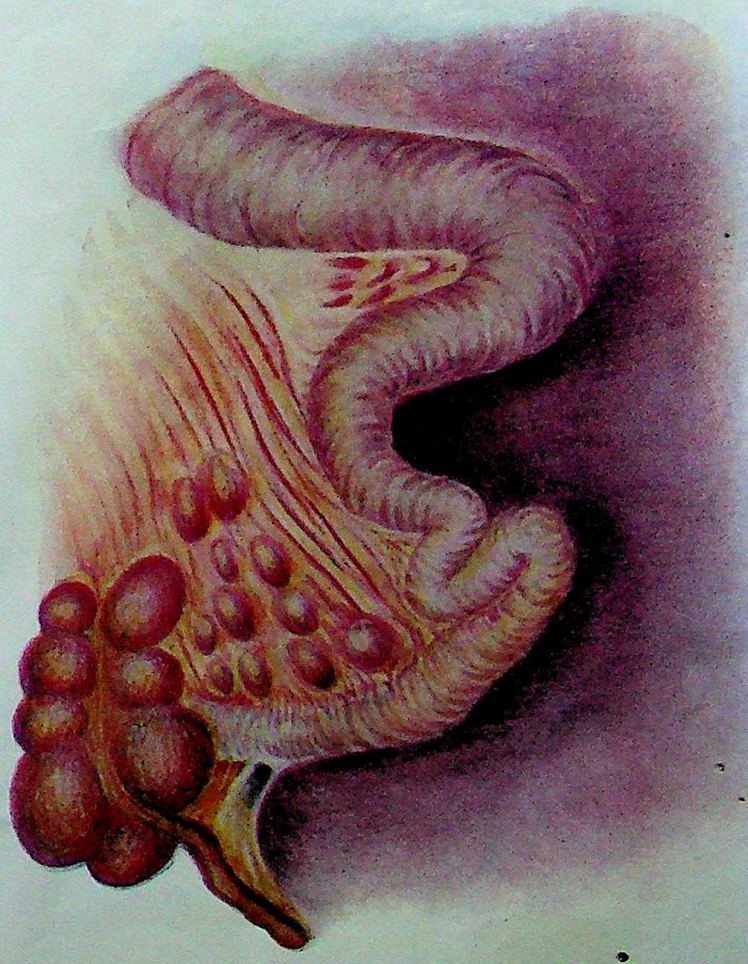

Fig. 2.—*Case* 4. Terminal ileum indurated and enormously dilated. The portion of the ileum at the ileo-cæcal junction is constricted on account of strictures due to chronic inflammation and fibrosis. The cæcum also is found to be slightly involved in the inflammation. The involvement of the mesenteric glands is also shown. The hose-like appearance of the dilated ileum is characteristic.

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of the mesenteric border. The mucosa is the seat of diffuse destructive ulcerative process. The remaining coats of the bowel are markedly thickened from inflammatory hyperplasia, giving the involved segment a hose-like structure. (This was markedly seen in one of the cases quoted below, no. 4.) The fully developed cases show a marked stenosis of the lumen and frequently walled-off abscesses, and perforations with resultant fistulæ which may extend into the colon. Perforation into the mesentery with the development of a walled-off abscess may give rise to peri-cæcal and peri-appendical adhesions and thickenings, giving the roentgenological appearance of hyperplastic tuberculosis. Usually there is some fluid in the peritoneal cavity, and the peritoneal surfaces are moderately hyperæmic and frequently present a granular appearance simulating slightly the lesions of miliary tuberculosis.

Microscopically the process resembles a low-grade inflammatory reaction characterized by an enormous widespread œdema with a mild cellular reaction, showing lymphocytes, plasma cells, monocytes and a few eosinophiles.

In the acute stage the diseased intestines may appear œdematous, hyperæmic or congested, and of a maroon colour. The mesentery may or may not be thickened and œdematous.

Although the disease is mostly found in the terminal ileum it may occur in the cæcum and the large bowel.

Clinical features

[illegible] divides the disease into four clinical types :—

(1) The symptoms of this group simulate those of acute intra-abdominal inflammation, appendicitis in particular. Pain and tenderness in the right lower quadrant, accompanied by cramps, fever and leucocytosis occur; there may or may not be a palpable mass. Operation reveals a greatly thickened and reddened terminal ileum, which has a tendency to bleed. The mesentery is œdematous with enlarged hyperplastic glands. The appendix may be involved by contiguity, but it shows no mucosal inflammation.

(2) Symptoms suggestive of ulcerative colitis occur in this stage with diarrhœa and cramp-like abdominal pains with blood and mucus in the stools occasionally. Severe anæmia may develop with marked loss of weight malaise and slight fever.

(3) In this group the stenotic stage follows the ulcerative. As a result extensive thickening of the intestinal wall giving rise to constriction and later on to obliteration, due to healing of the mucosal ulceration, is found. This is most marked in the region of the ileo-cæcal valve. The symptoms are those of partial obstruction of the small intestine. A mass is usually palpable. Violent cramps, occasional attacks of vomiting and constipation occur.

(4) In this stage multiple fistulæ are formed that may open either internally or externally, through the abdominal wall. Roentgenological examination may reveal these fistulæ which persist and resist surgical measures at closure, unless the bowel is resected.

The symptoms depend upon the location of the lesion. The higher the constriction the more pronounced are the symptoms of a high intestinal obstruction. The extent and severity of the lesions determine the predominant symptoms. The most typical cases are those of young adults who give a history of severe colic-like pains in the abdomen, occurring usually two to three hours after eating, with nausea and vomiting. The pain in these cases is intermittent and yet severe enough to require morphine. Visible peristalsis may be observed.

Although the disease is mostly found in the last portion of the ileum, the cæcum and the ascending colon are also found to be affected. In the cases quoted below, the cæcum was found affected as much as the lower portion of the ileum and in a couple of cases was the only organ affected.

In early stages, the radiogram shows obstruction of the terminal ileum without evidence of an intrinsic lesion in the cæcum. Other signs are: (*a*) the string sign in the terminal ileum which is similar to that already described by Crane, as occurring in the colon in mucous colitis; (*b*) filling defect proximal to the cæcum; (*c*) an abnormal contour of the last filled loop of the ileum; and (*d*) dilatation of the ileal loops proximal to the obstruction (Kanton). Reflex colonic spasm may be found to occur with contracture of the cæco-colon, but more likely of the cæcum proper.

An actual defect on the mesial aspect of the cæcum may be due to adhesions or fistulæ from the diseased ileum.

The course of the disease is very insidious. In the beginning the clinical features resemble chronic ulcerative colitis-diarrhœa, but without tenesmus and a little blood, lower abdominal pain, fever, continuous loss of weight and anæmia. As the lesion begins to cause obstruction, attacks of abdominal pain, especially in the lower right quadrant, increased peristalsis and vomiting occur. Fistulous tracks may be responsible for localizing symptoms elsewhere in the abdomen. The outstanding physical findings are: (1) a mass in the right iliac region; (2) evidence of fistula formation; (3) emaciation and anæmia; (4) a scar of previous appendicectomy; and (5) evidence of intestinal obstruction.

The disease runs a very slow course and it takes a couple of years to develop symptoms of obstruction. The age range is between 15 and 56 years.

Differential diagnosis

The lesion may be mistaken for appendicitis, ileo-cæcal tuberculosis, ulcerative colitis, lympho-sarcoma, actinomycosis or carcinoma. The

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diagnosis of regional ileitis is suggested when one encounters in an adolescent or a young adult the symptoms of chronic obstruction of the small intestines accompanied by signs of a low-grade inflammatory process like mild fever, slight leucocytosis, loss of weight, a variable degree of anæmia and a somewhat tender mass in the right lower quadrant or palpable *per rectum*. Usually there is a history of irregular constipation alternating with diarrhœa. Mucus and at times blood may be present in the stools.

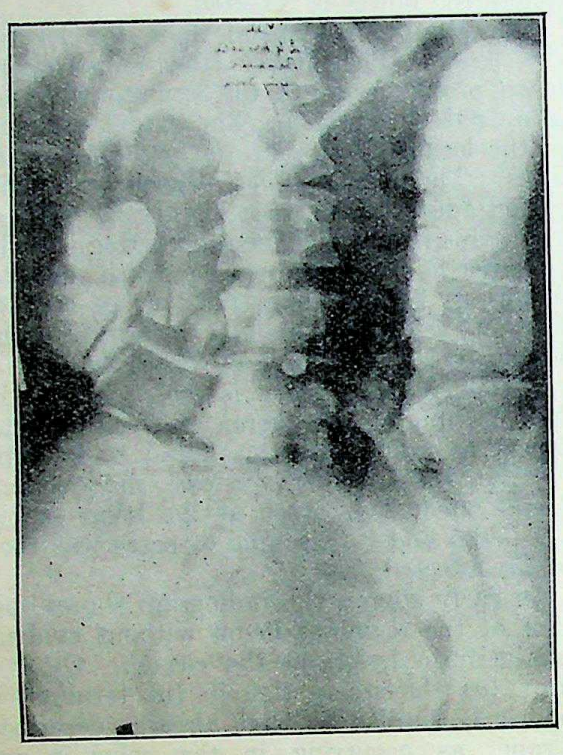

Fig. 3.

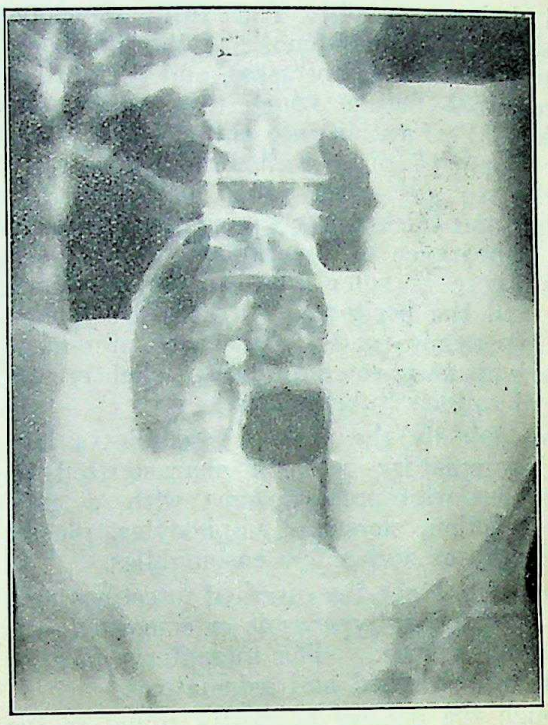

Fig. 4.

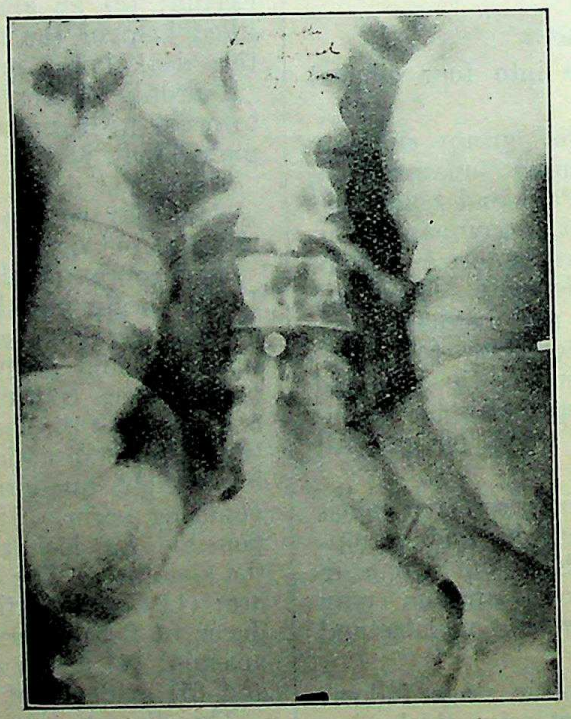

Fig. 5.

Figs. 3, 4 and 5.—Roentgenograms of case 4, showing well-marked dilatation of the ileum above the ileo-cæcal junction.

Roentgenography is of great help. As a rule regional ileitis begins with acute symptoms like recurring diarrhœa, with severe abdominal pains,

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which never occur in the case of either tuberculosis or malignancy. The course of the disease is much more prolonged in regional ileitis than in the other two diseases.

Treatment

In the early stages, as the disease is not properly diagnosed, the treatment is only symptomatic. After the lesion is fairly advanced with symptoms of obstruction, short-circuiting gives very good results. Resection need not be done except under special circumstances, such as presence of fistulæ, etc.

Below are given the histories of five cases which were at first diagnosed as either appendicitis, tuberculoma, or carcinoma, but from the history, gross appearance and pathological examination were found to be cases of regional ileitis.

Case 1.—Female, aged 19. Admitted in August 1933 for pain and swelling on the left side of the abdomen near the umbilicus. For the last three years she had been getting fever off and on, and dull pain round about the umbilicus which increased after food. The severe pain started about eight days previously all over the abdomen but more marked at the umbilicus and the right iliac fossa. When seen, a swelling was felt a little to the left of the umbilicus, very tender and boggy. Radiogram with barium enema did not show any abnormality in the colon or cæcum. It was provisionally diagnosed as a case of appendicitis.

On opening the abdomen the peritoneum gave evidence of recent inflammation. The uterus was small and undeveloped. Appendix looked slightly inflamed, and was removed. Cæcum looked quite normal. The small intestine about 12 inches away from the ileo-cæcal valve was found red and inflamed, covered with flakes of yellow organized lymph, and forming a loop of about eight inches with the great omentum firmly adherent to it. There were a good many enlarged glands in the mesentery, closely connected with the inflamed loop. From the appearance of the intestine, especially on account of the presence of the enlarged glands, it was taken for granted that the lesion was tuberculous. About ten inches of the ileum including the affected part were excised and lateral anastomosis was done. The patient made a good recovery and was discharged in good condition.

From the three years' history of abdominal pain, the lesion being localized to a portion of the lower ileum, the acute and subacute inflammatory reaction in the intestine, and the chronic inflammatory character of the glands, without evidence of caseation there is every reason to think that it was a case of regional ileitis, occurring in the small intestine a little more to the proximal side of the ileo-cæcal valve than is usually found (plate VI, figure 1). This case corresponds to the type 1 described by Crohn.

Case 2.—Male, aged 50, admitted in July 1935 for pain in right iliac fossa, and a tumour in the cæcal region. History of chronic pain in the right iliac fossa for some time. Diagnosed as a case of tuberculous cæcum. On opening the abdomen the cæcum was found to be thickened and inflamed. The ileum was not much affected. A large number of enlarged glands was found in the mesentery round about the ileo-cæcal junction. The ileum was divided about eight inches above the ileo-cæcal valve, and lateral ileo-colostomy done. A couple of enlarged glands were removed and on pathological examination were found to be ordinary inflammatory glands, without any evidence of tuberculous lesion. (Follicular hyperplasia as a result of simple chronic inflammation. No evidence of tuberculosis or malignancy.)

So this must have been a case of regional ileitis occurring in the cæcum without much evidence of the disease in the lower ileum.

Case 3.—Male, admitted for symptoms of vague abdominal pain with history of constipation. A hard irregular mass felt on the right side of the abdomen lateral to the umbilicus. On opening the abdomen a hard irregular round tumour of the size of a golf ball was seen about the middle of the ascending colon. Glands were found to be enlarged in the mesentery. Ileo-colostomy was done. The appearance of the lesion was not of the hypertrophic type that is usually seen in the tuberculous lesions of the cæcum and the ascending colon. Moreover, tuberculous lesions, especially independent of the cæcum, are rare in the ascending colon. So most probably it was a case of regional ileitis occurring in the ascending colon. The glands were not examined pathologically.

Case 4.—Male, aged 40, public worker. In 1921 he had to do a good deal of travelling in villages for social and political work, and had to be irregular as regards his meals, etc., living on milk diet which gave rise to flatulence. After that his health improved a bit but complaint of dyspepsia continued. He kept fairly good health in other respects till 1935.

In October 1935, at about ten o'clock in the morning one day he got severe abdominal pain with constipation and vomiting. Bowels worked after enema and pain stopped. The same thing—abdominal pain constipation, etc.—happened about a month later. These attacks now recurred every fifteen days and his weight began to decrease. On 5th January, 1936, he got a similar attack, but the abdominal pain did not disappear even after taking an enema and he felt severe borborygmi in the abdomen. He consulted a physician who advised him to stop taking rice and prescribed a special diet, with emetine injections. Gradually he started getting rigidity of the abdominal muscles on the right side along with pain in the part which made one suspect appendicitis.

He started taking liquid paraffin and olive oil for his constipation. Once he took a dose of santonin, ascribing the pain to worms. On 10th February, 1938, he got an enlargement of the right scrotum which subsided after about four days with local applications. From 27th February he started getting low fever, and was advised complete rest, and gold 'Bhasma' (calcined metallic gold) by mouth. This brought on some improvement in his health which was maintained till the end of August 1936. Then again he started getting abdominal pain with vomiting, so he changed his diet and lived only on soup and bread, which improved his condition a little, and he maintained fairly good health till January 1937. But again he started the old trouble of abdominal pain and constipation, and lost about 30 pounds in weight. When seen in June 1937, he was very much emaciated and his weight which was originally 137 pounds had come down to 93 pounds. Practically he was skin and bone. He complained of severe constipation with abdominal pain soon after food. On inspection movements of the intestine could be seen. The abdomen was slightly distended in the lower part and the abdominal wall was doughy to the feel. Apparently everything pointed to the existence of chronic obstruction in the small intestines, so the case was diagnosed as chronic intestinal obstruction, due to a tuberculous lesion situated most probably at the ileo-cæcal junction. A skiagram was taken which showed narrowing at the ileo-cæcal junction and an enormous dilatation of the lower ileum above the stricture. As the condition of the patient was very low about 300 c.cm. of blood were transfused which greatly improved his general condition and operation was done one week later.

On opening the abdomen the peritoneal cavity was found to contain a little serous fluid. The cæcum was found to be thickened and inflamed. The lower part of the ileum up to about eight inches from the ileo-cæcal valve was found to be narrowed and fibrosed, and contained in two places —at the ileo-cæcal junction and about seven inches above it—localized areas of

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thickening, indicating strictures. A good many glands were found enlarged in the mesentery at the ileo-cæcal junction. The ileum proximal to it to the extent of about 18 inches was thickened and enormously dilated (resembling a hose), devoid of normal lustre and of a dull grey colour. As the lesion was at first supposed to be tuberculous, the dilatation was ascribed to the stricture. Ileo-colostomy was done by anastomosing the portion of the dilated ileum about eight inches from where the dilatation began to the middle of the transverse colon. The convalescence was very smooth and the condition of the patient began to improve very steadily. The symptoms of obstruction disappeared and the patient started taking normal diet from the 15th day. His weight which was 84 pounds on 5th August, 1937, became 90 pounds on 15th August, 1937, and 115 pounds on 5th September, 1937. At present he is taking his normal diet, getting regular motions, and is free from all symptoms of obstruction like abdominal pain, borborygmi and vomiting. Appetite is good and he is getting his normal energy back.

This is a very typical case of regional ileitis with all the pathological characteristics and clinical symptoms of the disease. It is significant that although the dilated portion of the ileum which indicated chronic inflammation was anastomosed to the colon nothing untoward happened.

Case 5.—K. S. M., aged 35, admitted for pain in the epigastrium and round about the umbilicus. Tenderness most marked in the right iliac fossa. The trouble first began about six years ago, with pain in the lower abdomen, immediately after food, which increased gradually. He suffered from diarrhœa with mucus about five years ago.

When seen the patient was fairly well built and not much emaciated, and complained of loss of appetite and abdominal pain after food, most marked in the epigastrium. Well-marked tenderness in the appendicular region. A diagnosis of appendicitis was made. On opening the abdomen the cæcum was found to be slightly thickened and congested indicating chronic inflammation, but not showing the intramural hypertrophy typical of a tuberculous lesion. A group of enlarged glands was found in the mesentery at the ileo-cæcal junction. The ileum appeared quite normal. It was divided about eight inches from the ileo-cæcal junction and ileo-colostomy was done. The condition of the patient improved steadily.

The long history of the disease with acute attacks of colitis and the gross appearance of the cæcum with enlarged non-inflammatory glands are in favour of the case being one of regional ileitis. This is an atypical case where the lesion occurred in the cæcum, without involvement of the lower ileum.

Out of these, case 4 was the most typical case of regional ileitis; especially the naked-eye hose-like appearance of the intestines was exactly like what is described by Crohn. Case 1 came with symptoms of acute exacerbation and was operated on soon after the acute attack subsided. Here the lesion was localized to the ileum, some distance away from the ileo-cæcal valve. In cases 2 and 5 the lesion was confined only to the cæcum and a small portion of the ascending colon, the ileum being completely free. The naked-eye appearance was not at all like that usually seen in a tuberculous cæcum. Moreover the pathological examination of the enlarged glands, especially in one case, excluded tuberculous lesion.

About case 3, the lesion was not very typical of regional ileitis. But it had not the characteristic appearance of a tuberculous lesion either. The long history without any well-marked

(*Continued at foot of next column*)

THE TREATMENT OF SPLENOMEGALY BY INJECTIONS OF MILK

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and

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SINGH (1932) reported favourable results following the injection of milk intramuscularly in patients suffering from splenomegaly, more particularly when the enlargement of the spleen

(*Continued from previous column*)

obstructive symptoms or any secondaries was against malignancy. The whole appearance indicated a chronic inflammatory condition. So there is reason to think that it might have been an atypical case of regional ileitis occurring in the middle of the ascending colon.

Summary

1. Regional ileitis is a fairly common disease, and is often diagnosed as a tuberculous, a malignant, or an appendicular lesion.

2. The commonest site of the lesion is the lower eight to ten inches of the ileum. But it may occur in the cæcum, colon, or the ileum away from the ileo-cæcal junction.

3. Enlargement of the glands showing pure inflammatory reaction is an important diagnostic sign.

4. Dilatation of the intestine above the stricture with fibrosis and thickening giving the affected part a hose-like appearance is a characteristic feature of this disease.

5. The important symptoms are pain, often severe and cramp-like, diarrhœa, vomiting, fever and loss of weight with symptoms of chronic obstruction.

6. The *x*-ray picture is a filling defect in the terminal ileum, dilatation of the intestine proximal to the defect, and the characteristic string sign.

7. Resection or ileo-colostomy gives good results. Resection should not be done when the patient's condition is low, as the mortality may be high.

8. Many cases where persistent recurrence of pain occurs after removal of the appendix may be cases of regional ileitis which were wrongly diagnosed as appendicitis.

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was malarial in origin. Enlarged spleens which reached nearly to the umbilicus disappeared under the costal margin after three or four or at the most five injections of milk. In 1934 this method of non-specific therapy was started in the out-patient department of the Carmichael Hospital for Tropical Diseases. The patients selected for treatment were those with markedly enlarged spleens extending to the umbilicus or lower who gave no history of kala-azar and whose sera were negative both to Chopra's test and Napier's test for this disease. These patients had been under observation prior to the beginning of milk injections for at least three months, during which period the usual forms of medical treatment had been given without producing any appreciable effect on the size of the spleen. All the cases were afebrile, blood smears showed no parasites and in the majority there was a varying degree of anæmia. In view of the pressure of routine work in an out-patient department it was not possible to make complete investigations of each patient.

Skimmed fresh milk was sterilized on three consecutive days in required amounts in test-tubes. The milk was tinged lightly with phenol red in order to disguise from the patients the nature of the material injected. It is important that fresh milk from a reliable source be used as otherwise there is an enormous multiplication of bacteria the products of which might lead to undesirable reactions. A generous supply of Aolan was available through the courtesy of the manufacturer's agents and a small series of patients was treated with it. The results were similar to both series but when facilities exist for sterilization, for reasons of economy, milk is to be preferred. The results reported in this paper are those based on the treatment with milk alone.

Of the 100 patients treated 70 were given the milk injections intramuscularly and 30 patients intracutaneously. The dosage was (1) by the intramuscular route, preliminary dose of 4 c.cm. gradually increased to 16 c.cm. at intervals of five to seven days, and (2) by the intracutaneous route, 0.1 to 0.3 c.cm. with a maximum of 0.2 c.cm. at any one site at intervals of five to seven days.

Careful records were made of the size of the spleen, of the general symptoms and of any reactions following the injections. During the course of treatment no other medication was given.

The patients selected were 94 male adults and 6 female adults of the labouring class. The treatment by the injection of milk was popular and no difficulty was experienced in securing regular attendance of the patients. In fact the only difficulty was the extreme disappointment of those patients in whom there was no diminution in the size of the spleen and no marked improvement in the symptoms. In the majority of the patients in whom satisfactory results were obtained marked improvement was noted usually after the sixth or seventh injection. A certain number of the patients in whom marked shrinkage of the spleen had occurred were kept under observation for periods varying up to a year and no relapse was noted. The patients who did not react to the first series of ten injections failed to show any appreciable effect to further series of milk injections. The results of the treatment are given below in tabular form :—

TABLE I

The results of treatment of the whole series

	By the intramuscular route	By the intracutaneous route
Total number treated	70	30
Improvement noted in	50 or 71.4 per cent	16 or 53.3 per cent
Spleen not palpable after treatment	10 or 14.3 ,,	4 or 13.3 ,,
Spleen considerably reduced but still palpable	24 or 34.3 ,,	10 or 33.3 ,,
Slight diminution in the size of the spleen but definite improvement in the symptoms.	16 or 22.8 ,,	2 or 6.6 ,,
No appreciable difference in the size of the spleen and no improvement in the symptoms.	20 or 28.6 ,,	14 or 46.7 ,,

It will be seen that the intramuscular route appears to yield better results but if the figures for those in whom the spleen was considerably reduced are compared there is no appreciable difference in the results obtained by the two methods. In the series treated by the intramuscular route the spleen was markedly reduced in 34 or 48.5 per cent of the patients treated and in patients treated by the intracutaneous route the spleen was reduced in 14 or 46.6 per cent.

The results in table II show that better results were obtained in the patients suffering with enlarged spleens reaching to about the level of the umbilicus than in the patients in whom the spleen was larger. Although the number of patients treated was not sufficiently large the general impression that was formed during the course of this trial was that in patients in whom the spleen was not hard and not sclerosed the shrinkage of the spleen occurred quicker and was complete usually before the end of the series of the ten injections of milk.

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TABLE II

The results of treatment according to the size of the spleen prior to treatment

	Spleen up to umbilicus	Spleen below umbilicus
Total number treated	68	32
Improvement noted in	55 or 80.7 per cent	11 or 38 per cent
Spleen not palpable after treatment	12 or 17.6 „	2 or 7 „
Spleen considerably reduced but still palpable	32 or 47.0 „	2 or 7 „
Slight diminution in the size of the spleen but definite improvement in the symptoms.	11 or 16.1 „	7 or 24 „
No appreciable difference in the size of the spleen and no improvement in the symptoms.	13 or 19.3 „	21 or 62 „

Summary.—The results of the treatment of a series of one hundred patients suffering from splenomegaly not of kala-azar origin with injections of skimmed sterilized milk are recorded. The results show that there is a marked reduction in the size of the spleen in approximately 50 per cent of the patients treated.

From the data available the results after the injection of the milk by the intramuscular route are better than the results after the intracutaneous route, probably because of the greater amount of foreign protein injected by the former route.

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MODIFIED TECHNIQUE FOR PHRENIC EVULSION

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THE most important modification from the ordinary technique adopted for operations on the phrenic nerve is the posture of the patient. He is kept in the sitting posture with slight inclination backwards sufficient to make him comfortable. An adjustable chair, such as a dental chair, is preferable, as in case the patient faints the head can be lowered immediately. The head is kept turned towards the opposite side. It is important that the upper limbs must be hanging down, without the elbows or hands resting anywhere. This simple precaution enables the muscles of the neck to be kept taut.

Four cubic centimetres of a 1 per cent novocaine are all that is ordinarily used for local infiltration of the part, 2 c.cm. for the skin and subcutaneous tissue, 1 c.cm. along the lateral border of the sterno-mastoid and 1 c.cm. underneath the deep fascia covering the scalenus anterior.

An incision 1 inch in length is made, parallel to and 1½ inches above the clavicle with the centre of the incision on the lateral border of the sterno-mastoid. As the scalenus anterior can be easily palpated when the patient is in this posture the incision can be made to cover the whole breadth of that muscle. The incision can be deepened to involve the skin, subcutaneous tissue and platysma. The lateral border of the sterno-mastoid is defined and retracted medially. The position of the scalenus anterior is made sure by the palpating finger, and the fascia covering it is separated by blunt dissection. The pad of fat underlying it is also separated in the same way. The nerve is found to lie on the scalenus anterior crossing it from the lateral to the medial side.

Further procedure is the same as in the usual technique. I have successfully adopted this technique in 93 cases.

A Mirror of Hospital Practice

TYPHOID FEVER PRESENTING SOME UNUSUAL FEATURES

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K. P. A., a Hindu male, aged 25, arrived in a military station for training on 3rd February, 1937, from his village five miles away. On the same day he was inoculated with 1 c.cm. of T.A.B. vaccine. After the inoculation he received 48 hours' 'excused duty' and had no complaints.

On the 16th, he reported sick complaining of fever, cough and cold. He said he had been having fever for three days with abdominal pain at night. On examination his temperature was 99°F., pulse 86, respiration 22. His tongue was clean and no abnormal physical signs were present anywhere. His blood for malaria was negative. On the 17th evening his temperature was 102°F. having risen steadily without remissions, pulse 100, respiration 26. His bowels moved for the first time that evening since reporting sick.

On the 19th he was admitted to the hospital. That morning his temperature was 102.2°F., pulse 80, regular, volume and tension good. The tongue was clean and moist anteriorly, but furred posteriorly; throat congested, abdomen retracted, liver and spleen not palpable. Nothing abnormal was detected in other systems nor in the urine or stools. Leucocyte count showed total white blood corpuscles—6,800 per mm., polymorphonuclears—60 per cent, lymphocytes—35 per cent, large mononuclears—3 per cent, eosinophils—2 per cent. No parasites were found.

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Widal reactions.—

	21st February	25th February	1st March	6th March	21st March
Bact. typhosus	0	+ 1/175	+ 1/175	+ 1/175	+ 1/400
Bact. paratyphosus A ..	0	+ 1/125	+ 1/125	+ 1/35	+ 1/35
Bact. paratyphosus B ..	0	+ 1/125	+ 1/50	+ 1/35	+ 1/25
Bact. typhosus O	+ 1/25	+ 1/125	+ 1/250	+ 1/250	+ 1/175
Bact. paratyphosus AO ..	0	0	0	0	0
Bact. paratyphosus BO ..	0	+ 1/25	+ 1/25	+ 1/25	0

On the 21st and 22nd, *i.e.*, on the 6th and 7th days of the illness his temperature was normal at noon, rising to 100°F. and 101.4°F. in the respective evenings. His general condition remained good. He was given 0.3 gm. metarsenobillon subcutaneously; this caused no change in his condition.

On the 26th (11th day) he passed a stool at 2 a.m. containing about 6 ounces of altered blood; his temperature fell to normal at noon for four hours, rising in the evening to 99.4°F. That day he had five melænic stools. He was put on calcium lactate, tincture of opium and quinine and had no more motions for 48 hours.

From the 27th (12th day) onwards the fever was continuous but gradually came down by lysis. On 9th March, being tired of the restricted diet he took some solid food from another patient and promptly got a relapse. It lasted 29 days and the temperature reached 104°F. on two occasions. There were no complications. After the 51st day he had no more fever and was discharged on 28th April.

Laboratory findings.

Bact. typhosus was isolated on blood culture taken on 22nd February, 1937.

This case raises several points for discussion :

1. The average incubation period of typhoid fever is 10 to 14 days. This patient was inoculated on 3rd February and the first sign of illness did not appear till the 13th. Does this mean that inoculation during the incubation period does not stop the disease ?

2. The course of fever was very unlike that of typhoid. In fact it was a bacteriological rather than a clinical diagnosis. Was such a course of fever due to prophylactic inoculation ?

3. Such a protracted course of illness in spite of prophylactic inoculation is rather unusual.

4. Is it possible that the inoculation itself could have contributed towards the illness ? The lapse of 10 days after the inoculation which coincided with the incubation period was interesting.

A PSEUDO-MALIGNANT TUMOUR OF THE ILEO-CÆCAL REGION

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A TUMOUR in the ileo-cæcal region when it simulates a malignant tumour but is not actually malignant is interesting, as radical operation is undertaken on the presumption that it is malignant. Such pseudo-malignant tumours were reported by Moynihan in his articles entitled 'Mimicry of malignant disease in the large intestine', by Robson in 1908 who pointed out similar inflammatory tumours simulating malignant disease. About the same time, Proust (1907) in France, and Braun in Germany reported similar experiences. In all their cases,

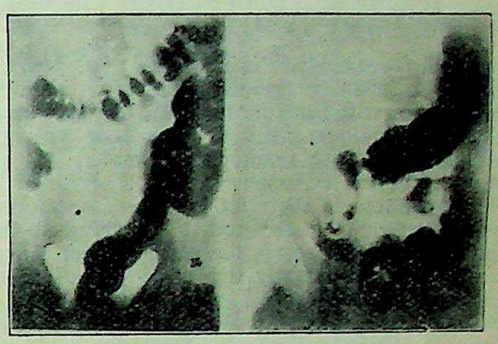

Fig. 1.—Showing the *x*-ray picture after a barium enema.

Fig. 2.—Showing the *x*-ray picture two and a half years after resection of cæcum and ascending colon and proximal half of transverse colon and end-to-side anastamosis.

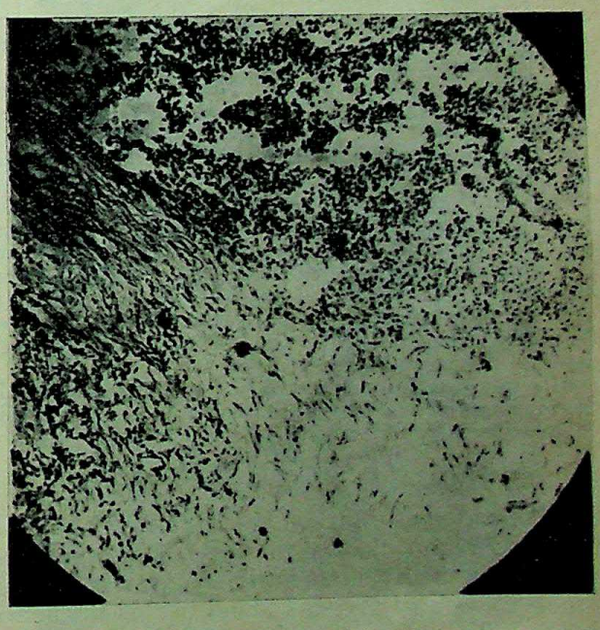

Fig. 3.—Showing the photomicrograph of the specimen.

their original diagnosis of malignant tumour was supported by classical symptoms of large bowel malignancy, *viz*, loss of weight, bleeding, colic and obstruction. It was only after operation

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and histological study that the inflammatory nature of the tumours was established.

Mock in 1931 reported 10 similar cases, and he believes that the process arises primarily from a gastro-intestinal focus. The major portion of the mass was found in the mesocolon with progressive and secondary infiltration of the gut wall fading into the muscularis mucosæ without any changes in the mucosa itself. He has classified the ætiological factors under the following heads:—

(1) Conditions existing in the gastro-intestinal tract.

(2) Extra-peritioneal infection which spreads to and involves the gastro-intestinal tract.

(3) Traumata due to surgical procedures or extraneous injury.

Case: An emaciated male, aged 60 years, was admitted in 1933 for treatment of acute pain in the right iliac fossa with constipation. He had been operated on for right oblique inguinal hernia one year before. On admission he was markedly emaciated and gave a history of passing of mucus but not of blood in his stools. A tumour in the right iliac fossa was found and an elongated bulging occurred on coughing at the site of the old operation scar. The mass did not move with respiration, it was slightly tender on palpation and its edges could not be defined exactly; the surface of the mass was smooth; consistency firm and on percussion it was dull. Occasionally a distinct bulge could be seen associated with intense colic and discomfort to the patient. A barium meal examination was not done for fear of intestinal obstruction, but a barium enema was given and the picture showed no filling defect in the large bowel. All the other systems were found normal. His systolic blood pressure was 110 mm. and diastolic 70 mm. and so under local anæsthesia (para-abdominal block) the abdomen was opened by a right para-median para-umbilical incision. On opening the abdomen the cæcum was found adherent to the anterior abdominal wall and while freeing it a mass was noticed at the ileo-cæcal junction, with enlarged glands along the ileo-colic vessel. The cæcum and ascending colon were mobilized right up beyond the hepatic flexure and a colectomy was performed including the distal 6 inches of the ileum and the proximal half of the transverse colon. An end-to-side anastomosis of the ileum with the transverse colon was done after closing the cut end of the transverse colon. The posterior abdominal wall was peritonized and the abdomen closed with a drain in the right para-colic gutter through a stab incision one inch in front of the anterior superior iliac spine. A radical operation was undertaken on the presumption that the tumour was malignant. The patient made an uneventful recovery and was discharged cured on the 14th day after the operation. The specimen after removal proved to be non-malignant.

His case has been followed up to date and he is keeping perfect health and the end-to-side anastomosis is functioning well as shown in the figure.

Pathological appearances of tumour

Macroscopic.—Marked thickening of the wall of the cæcum; ileo-cæcal angle shows marked thickening with enlargement of glands and a small abscess cavity was found in this thickened mass. The mucous membrane of the cæcum was found to be normal in its entire extent.

Microscopic.—All the layers of the cæcum are found to be normal, but outside this there is an area of dense fibrous tissue showing a few foci of round-cell infiltration with chronic inflammatory tissue.

This case illustrates a pseudo-malignant tumour due to traumatic cause after surgical procedure, *viz,* operation for right inguinal hernia, as suggested by Mock.

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A CASE OF JEJUNAL DIVERTICULOSIS

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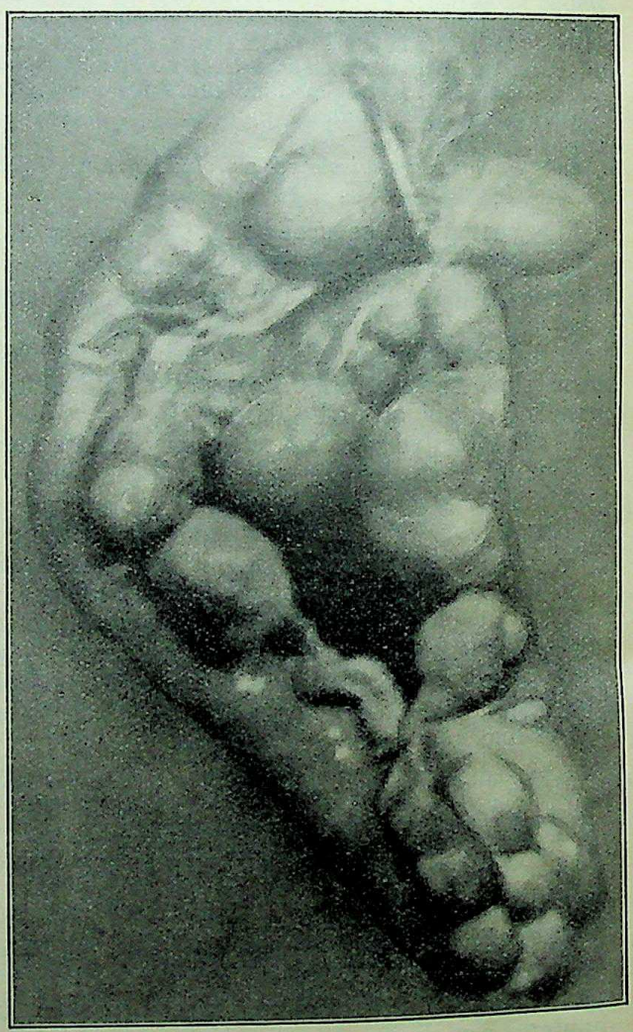
SURJU, M. M., aged 60 years, was admitted into the Mayo Hospital for enlarged prostate, and died two days after prostatectomy.

Post-mortem examination showed marked thickening of the wall of the urinary bladder. Kidneys showed marked pallor of the cortex with greyish streaks and points indicative of ascending pyelo-nephritis.



The jejunum, from a point about one foot from the distal end of the duodenum, showed multiple diverticula for a length of about two feet. The diverticula were twenty-two in number and varied in size from a large pea to a walnut.

Right lung showed hypostatic congestion. Left lung showed massive collapse. Liver fatty. No macroscopic abnormality detected in other organs.

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The cause of death was pulmonary collapse. The jejunal diverticula were an accidental finding. The diverticula were all situated at the mesenteric border, separating the leaves of the mesentery, and their orifices, which varied according to their size, were large enough to permit easy emptying of their contents. No muscle tissue could be detected in the walls of the sacs sectioned. An atrophied mucosa covered by fibrous tissue constituted the wall.

This case is reported because of its comparative rarity. To the writer's knowledge, no case has so far been reported in the medical press in India. This is the first case he has encountered amongst the pathological autopsies performed in the King Edward Medical College, Lahore, during the last 15 years. The college museum is about 60 years old and does not possess any specimen of multiple diverticula of the jejuno-ileum.

Ian Fraser (1933), writing on diverticula of the jejuno-ileum, reports coming across only two cases on going through 5,000 case records in the Royal Victoria Hospital, Belfast.

He quotes Sheppe as having collected only 30 cases from the literature of 80 years until 1923, Reinhardt finding three cases only out of 5,000 autopsies and Henri Goddard 16 out of 13,069.

The incidence of this condition is roughly stated to be as one per thousand. Results of exploratory laparotomies since 1914 and to radiography since 1920 are also reported to emphasize the rarity of this condition. This abnormality is said to occur in elderly people. Ian Fraser quotes cases, finding the average age for men in his series as 66 and for women 60. The preponderating incidence is reported to be in the male sex. Twenty-nine males to 11 females were found in a series of 40 cases and the enlargement of the prostate was a frequent finding in many of the males. Diverticula of the colon, Meckel's, and duodenum are fairly common and figure among the exhibits of most pathological museums in India; not so the jejuno-ileal diverticula, particularly the multiple variety incident in the upper part of the jejunum as found in the case under report.

The museum of the Calcutta Medical College, about the richest in India in the number of its exhibits, has five specimens of jejunal diverticula, of which only one shows the multiple variety with three large diverticula in the upper part of the jejunum. This specimen was collected in 1901. The other four specimens show just one diverticulum each and two of these represent the commoner type occurring at the duodeno-jejunal junction. It has three specimens showing one diverticulum each in the ileum.

The museum of the King George's Medical College, Lucknow, possesses two specimens of diverticula of the small intestine, of which only one is of the multiple variety and similar to that of the case under report.

The museum of the Madras Medical College possesses three specimens of diverticulosis of the small intestine, of which but one is of the multiple variety.

In the Bombay Pathological Museum the writer did not come across any specimen of multiple diverticulosis of the jejunum analogous to the one described in this paper.

On the basis of age-incidence and anatomical position, multiple diverticula of the jejuno-ileum are supposed to follow the sclerosis of vasa recta arising from the superior mesenteric artery.

Helvestine (quoted by Ian Fraser) also considered rise in intra-abdominal pressure associated with conditions of strain, as in cases with enlarged prostate, a probable ætiological factor.

The case under discussion had at least the factors of age and prostatic hypertrophy qualifying him for exhibiting jejunal diverticulosis.

I am very grateful to Dr. Hamid and Dr. Tirumurtie, Professors of Pathology, respectively at Lucknow and Madras, for the detailed information they have furnished me regarding the specimens in their museums.

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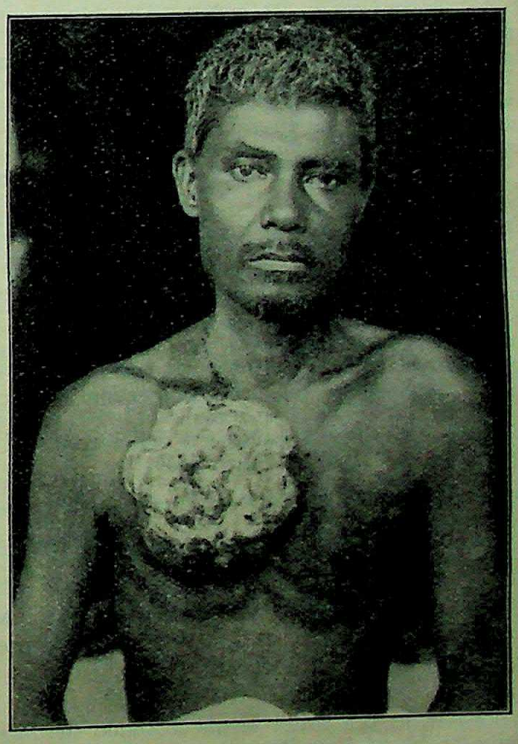
A CASE OF BREAST CANCER IN A MALE

By A. C. DEY, L.M.F. (Cal.)
Senior Resident Medical Officer, Astanga Ayurveda Hospital, Calcutta

M. L. S., Hindu, male, aged 50 years, a resident of the Dacca district, was admitted to the



Astanga Ayurveda Hospital on 25th May, 1936, for the treatment of a large circular fungating mass on the right mamma.

Previous history.—The patient said that about two years ago he noticed a small tubercle-like growth on the right nipple. Gradually it went on increasing

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in size and in the course of a few months, he began to feel uncomfortable while wearing underwear and shirts. He consulted a local medical practitioner who removed the growth. A few months after the operation, he noticed a bigger mass than the first just beneath the incised area and was again operated upon. The second operation gave him no relief and instead a raw surface was left. He again consulted a medical practitioner who incised and scraped the part and stitched it up. But the stitches gave way after a few days leaving a raw area about four to five inches in diameter and a gradually increasing hard mass. The patient did not give any history of any constitutional disturbance in the beginning of his illness but said that after the third operation which was about a year before his admission, he began to get moderate rise of temperature and other constitutional disturbances such as anorexia, constipation, gradual loss of weight and strength, sleeplessness due to local pain, and a disturbed state of mind. From the raw area there was purulent discharge and the surface bled on slight touch. As the patient was a business man he continued his normal duties as far as practicable with his clothing on, which caused occasional friction and bleeding from the wound. The patient gave no history of wearing any tight clothing and there was no abrasion or scratch over the site of the growth before it appeared.

Condition on admission.—The patient looked very ill and was extremely anxious to have the tumour removed as he was in great distress. Pulse rate 115/26 per minute. Axillary temperature—101°F. Tongue—coated and dry. Lungs—no adventitious sounds present. Heart—no adventitious sounds at the apex, aortic or tricuspid areas. The pulmonary area presented a systolic bruit (hæmic). The liver and spleen—not palpable. Axillary and cervical lymph glands were not palpable.

There was a cauliflower-like growth in connection with the right mamma with profuse foul-smelling discharge and slough over the surface. The tumour bled on slight interference. The root was four inches in diameter. The breadth of the tumour was nine inches and the circumference 23 inches. The blood picture showed typical secondary anæmia with a hæmoglobin value of 32 per cent (Sahli) and a total red cell count of 1,530,000 per c.mm. and a moderate degree of leucocytosis. The hæmoglobin and total red cells increased to some extent with a course of iron and arsenic injections in combination with liver preparations but this increase was transitory due to hæmorrhage off and on.

Treatment was aimed at improving the blood condition (a course of whole blood was given but no transfusion was possible for want of a donor), and relieving other constitutional troubles. Local application of styptic and antiseptic lotions were used and a few exposures to diathermy were given. No operative procedure was undertaken for fear of hæmorrhage and the poor condition of the patient. Sectional examination revealed it to be a spheroidal-celled cancer with much fibrous tissue and scanty epithelial cells and the patient died on 11th November, 1936.

Special points to note in this case are :—

(1) Rarity in males, (2) huge size, (3) absence of metastases.

I wish to thank Dr. D. P. Ghosh, B.A., M.B., the visiting surgeon, for kindly allowing me to publish the notes of this case.

[*Note.*—If, as the writer seems to think, the anæmia was due to blood loss, it was unnecessary to consider blood transfusion, however many donors had been available. Large doses of iron would almost certainly have doubled the hæmoglobin percentage, after which the patient might have been fit to undergo an operation. Whether or not this would have been worth while undertaking is, however, another matter.—Editor, *I. M. G.*]

GASTRIC CANCER IN A GIRL OF 19

By ABINAS CHANDRA DE, L.M.P.

Assistant Medical Officer, Rajgarhali T. E., Makum Junction P. O. (Assam)

A GIRL, about 19 years of age and mother of one child about three years old, was admitted into the hospital on 18th April, 1937, with complaint of a constant pain and flatulent distension of the abdomen, and a feeling of distress and increased pain about the epigastrium after taking food. This was partly relieved by vomiting four to six hours after meals. These and other minor dyspeptic troubles had continued for a little over a month previous to her admission into the hospital. She also gave a history of amenorrhœa for four months.

Physical examination.—Abdomen highly distended with gas. Spleen and liver enlarged. Stomach could not be outlined owing to excessive flatulence. Temperature 97°F., pulse 90, respiration 28 per minute, heart slightly dilated, with hæmic murmur over precordium. Lungs normal. Hæmoglobin 30 per cent (Tallqvist). Urine normal. No signs of pregnancy and no abnormal tumour could be felt in the epigastrium or any other situation. Vomit contained undigested rice and other food particles. Cachexia was marked.

She lived for 28 days after admission during which time the following points were observed :—

From the day after admission she started to get a rise in temperature which continued irregularly till her death on 15th May. Her flatulence could not be relieved up to the last in spite of very careful and judicious dietary and carminatives. It was only three days before death that a hard and nodular growth could be felt in the epigastric region; it was tender on manipulation and slightly movable. During the latter part of her stay in hospital she used to vomit at long intervals and brought up typical coffee-ground liquid in abundance and her pain also increased severely for which free administration of opiates became necessary.

Post-mortem examination.—On opening the abdomen the stomach was found to be highly dilated and its great curvature displaced downwards almost into the pelvis. It contained ten ounces of viscous fluid. The gastric mucosa was thickened and injected: no ulcer found. A tumour was found in the pyloric end attached to its lesser curvature. On dissecting out the tumour it appeared nearly round and measured six inches in circumference. It was hard and irregular on the surface with papillomatous projections. No sign of ulceration was noticed on its surface. The pyloric orifice was highly stenosed. The duodenal end of the pylorus was taken out and on section diffuse spots of induration were visible on its mucous surface. Lymphatic glands along the lesser curvature were enlarged and indurated and some of the neighbouring mesenteric glands were also found similarly involved.

Pathological report.—Sections from the tumour were sent to the pathologist, Berry White Medical School, Dibrugarh, for examination and report who stated 'The histological picture is suggestive of adeno-carcinoma'.

The extreme rarity of gastric cancer at such an early age and its peculiarly short duration (only a little over two months from the first symptom to death of the patient) are of interest.

My thanks are due to Dr. H. L. Slaughter for his permission to publish this case note, and also to Dr. R. M. Deb for the histological report.

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Indian Medical Gazette

APRIL

HYDATID DISEASE

A few years ago attention was drawn to the apparent frequency of *Cysticercus cellulosæ* in man in India by the reporting of this infection in a relatively large number of British soldiers, who appeared to have acquired it while stationed here, but from the literature the impression is gained that *Tænia solium* in human beings, and the larval stage in pigs and men, are rare. We venture to express the opinion that such an impression is false and is engendered by lack of adequate information on the incidence of this condition among the indigenous population.

Much the same state of affairs exists regarding hydatid disease and about five years ago a short paper appeared in our columns in which indirect evidence was adduced that hydatids are really much commoner in India than published records would lead one to suppose.

Until recently there was no further support for this conclusion because only three or four reports of single cases had appeared in the literature in the intervening period. In our issue of February last, however, there is a paper of great interest and importance regarding hydatid disease in this country. This paper gives records of twenty-seven cases proved by operation to be hydatids and thirteen more diagnosed clinically. That is, a total of forty persons with hydatid disease attended one small district hospital in the course of about six years, and it should be noted that these figures probably only represent a fraction of the actual cases that really exist in the area, because it is probable that many have not presented themselves at the hospital, either on account of the prejudice against such institutions that unfortunately is still common, or on account of distance making attendance difficult or impossible. The population from which this hospital draws its clientele is approximately 200,000, and as far as evidence is available the hydatid-infected members of the community come from all over the district and all castes appear to be equally represented. It therefore cannot be accounted for by a small heavily-infected focus that might be explained by special local conditions.

The medical officer who furnished this report carried his investigations further and found that over fifty-two per cent of the stray dogs he examined harboured the adult *Echinococcus granulosus* and that over 89 per cent of the cattle showed larval infection; sheep and goats are apparently not commonly infected. With such a high incidence of animal infection it is not surprising that the disease is common in human beings also, more especially as the water supply is distinctly primitive and the opportunities of its contamination by dogs innumerable.

This record is in itself perhaps not very startling when the total population of India is taken into account, but there is no reason for assuming that this small district is in any way different from hundreds of others, so that there is little doubt that the incidence of hydatid disease is equally heavy in many other parts of the country and that it must be producing high mortality and morbidity rates that at present are not being recorded. Unfortunately, the onset of the disease is insidious, it usually takes years to develop, it exerts a continual and steady drain on the health of the population and it never attracts attention by an epidemic outburst, so that its serious character is not appreciated by the general public, and no demand is made that such an important menace to health should be prevented.

The life history of this parasite has been thoroughly worked out and it is briefly this. Dogs, and to a lesser extent wild carnivora such as jackals and wolves, eat the flesh of cattle and sheep that contains the cystic or larval stage of the worm known as hydatid cysts. They develop in the intestine of these animals into adult worms and the eggs are passed in the fæces. When the water supply is drawn from surface tanks it is practically without exception polluted with the fæces of all domestic animals, including dogs, so that the high rate of animal incidence is maintained, and man, who drinks the water from these tanks also, frequently becomes the victim of hydatid disease.

It is clear that infection with this parasite can easily be prevented by approaching the problem from the single direction of dealing with dogs. The number of unwanted dogs in every village and town in India is too well known to need enlarging upon and the importance of their destruction has long been recognized as a means of reducing rabies, and to this should be added the danger of their transmitting hydatid disease, as further reason for their extermination. Properly-cared-for dogs whose feeding is controlled need not be got rid of because if they are prevented from eating contaminated meat they are no danger to man in this connection.

Such a step in the direction of disease prevention in the villages will need education of the individual and this appeals to us as one of the aspects of public health improvement that could be very effectively dealt with by the rural health units that are becoming gradually established in the country districts.

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Special Article

CONDITIONED REFLEXES *

By S. L. BHATIA, M.C., M.A., M.D. (Cantab.), F.R.C.P. (Lond.), F.R.S.E.
LIEUTENANT-COLONEL, I.M.S.
Dean and Professor of Physiology, Grant Medical College, Bombay

I.

THE main facts about the conditioned reflexes are no doubt known to you all. They are well established and may be briefly described. Pavlov introduced a new method for investigating the normal functions of the central nervous system and especially of the higher centres. He divides all reflexes into 'unconditioned' and 'conditioned'. The '*unconditioned reflexes*' are inborn and transmitted by heredity. The conditions in which an animal lives do not influence their formation. All the spinal and bulbar reflexes including the visceral, somatic, protective, postural, feeding and sexual reflexes belong to this group. They are probably the basis of 'instinct'. The '*conditioned reflexes*' on the other hand are acquired during the life of the individual. Consequently they are individual in their distribution and unlike unconditioned reflexes do not belong equally to all the members of the species. The conditions in which an animal lives determine their formation. Adaptation to environment depends on the power of the individual to acquire new conditioned reflexes—on his power to learn, unlearn, and learn again according to the variations in the conditions in which he lives. It is not known to what extent these reflexes are hereditary. They are characteristic of the higher animals, in whom the brain possesses a vast amount of 'associations' between different centres, and the faculty of discrimination and judgment. They originate in association with well-established unconditioned reflexes, which form the substratum. Quite a number of such reflexes may be developed around a simple inborn reflex. 'The higher the animal's nervous system, the greater the number and complexity of the conditioned activities it presents'. (H. Hartridge.)

You all know the classical example of a conditioned reflex. When food or acid is placed in the mouth of a dog, a reflex secretion of saliva is produced, which can be collected from an artificial fistula and measured. This is an unconditioned reflex with its centre in the medulla, and can be elicited in a decerebrate animal. Now if a second indifferent stimulus such as a sound is applied when the animal is being fed or just before, and this act is repeated a number of times, the sound becomes an adequate stimulus for the production of saliva, even without food or acid in the mouth. This is a conditioned reflex. At first the reflex is diffuse but by further repetition and training it becomes localized, so that a particular note only will evoke a response. In the dog a differentiation between a note of 800 and one of 812 vibrations can be established. This differentiation is due to a process of internal inhibition.

For these experiments the salivary gland is used most often because the response (secretion of saliva) can be determined quantitatively, but visual, tactile and all types of sensory end-organs and many varieties of stimuli can be used to establish these reflexes. Apart from the salivary secretion, the other varieties of responses used are the contractions of skeletal muscles, reactions of pupil, changes in the heart rate, gastro-intestinal movements and secretions, respiration, and reactions of the vasomotor system.

The conditioned reflexes are of two varieties, namely *positive or excitatory*, and *negative or inhibitory*. The conditions necessary for the establishment of the positive reflexes are that the animal should be in good health, the conditioned stimulus should begin to operate before the unconditioned stimulus is applied, and slightly overlap the latter. An alert mental condition of the animal is necessary. The cerebral cortex must be protected from other conflicting modes of stimulation. For this reason, the experiments are carried out in a dark, sound-proof room away from the observer, who watches the animal through a window. Almost any stimulus can become suitable if properly applied. It is necessary that it should be followed or 'reinforced' by the unconditioned stimulus. 'Trace' conditioned reflexes, either 'short' or 'long', are established when a definite interval elapses between the conditioned and unconditioned stimuli. Even 'duration of time' may become a conditioned stimulus.

New conditioned reflexes can be established by 'linking' the action of a new stimulus with a conditioned reflex already established. These are known as 'secondary' conditioned reflexes. Tertiary, quaternary, and other reflexes without end can be established in man; but in the dog tertiary reflexes are the limit. This phenomenon of 'linking' indicates the manner by which the most complicated associations are developed in the cortex by building one reflex upon another. This function is acquired by each individual, the process being one of *signalization*, by which a signal or an unconditioned stimulus evokes the same response as the stimulus with which it has been primarily associated.

The conditioned reflexes obey certain physiological laws, namely summation, irradiation, specificity, discrimination, reinforcement and linking.

The negative conditioned reflexes cause inhibition instead of excitation. They are due to

* Paper read at the Indian Science Congress, Hyderabad, Deccan, January 1937.

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the faculty possessed by the cortex of discriminating between the stimuli, so that unsuitable responses do not occur. These reflexes are of various sorts, but probably the ultimate mechanism of all is the same. This inhibition is an active process and it may be external or internal. External inhibition is due to the presence of an extraneous stimulus and may be temporary or permanent. It appears to depend on the impulse rather than on the acquired properties of the cortex. Internal inhibition is dependent on the inhibitory discharges from the cortical cells. It occurs when the conditioned stimulus is repeated without the accompaniment of the unconditioned stimulus. Its examples are the phenomena of inhibition by *extinction*, conditioned inhibition, inhibition by retardation and differential inhibition. There is again the phenomenon of *disinhibition*, or inhibition of inhibition, by which one inhibitory process can inhibit another, so that the original excitatory reflex occurs.

The conditioned reflexes are a function of the cerebral cortex. The primary function of the nervous system, according to Pavlov, is to maintain a dynamic equilibrium between the functional units within the self-contained system of the organism and between the organism as a whole and its environment. The pre-eminent function of the lower parts of the central nervous system is to integrate the activities of the separate parts within the organism. But the most delicate adjustments between the organism and its environment are pre-eminently the function of the cerebral hemispheres. Removal of the cortex abolishes all conditioned reflexes, and prevents the formation of new ones. Localized damage produces partial loss, but the establishment of inhibitory reflexes becomes particularly difficult. The cortex is therefore an important inhibitory organ.

The *reflex arc*, according to Pavlov, is divided into three parts :—

(1) The part that begins in every natural peripheral end of the centripetal nerve and ends in the receptor cell in the central nervous system. This is known as the *analyser*. The task of this consists in decomposing the entire world of stimulating influences falling on the organism from the outside. The higher the animal, the finer is their decomposition.

(2) The part which must join the brain end of this analyser with the effector apparatus. This is known as the *connection* or *lock*.

(3) The working apparatus or the *effector* organ.

Pavlov asserts that the cerebral hemispheres consist of sensory or receptive centres, *viz*, the brain endings of the analysers. It would appear that a considerable part of the hemisphere is composed of these analysers. The occipital and temporal regions are of course the centres for eye and ear respectively. Even the so-called motor centres should be considered receptor centres from another receptor surface which has a special relation to movement.

The peripheral apparatus, the analyser, consists of a number of so-called transformers which convert different forms of energy into nerve energy. And a conditioned reflex is an act of synthesis by the cerebral cortex, the whole of which is concerned with the reception of impulses. Irradiation and concentration are fundamental laws of higher mental activity.

II.

Conditioned reflexes thus offer us the means of objective investigation of the activity of the central nervous system. They have certain important applications in the case of man. They are probably the basis of training and education, and are related to the 'behaviour' of the individual. Formation of 'habits' depends on acquiring certain conditioned reflexes.

Man's capability to develop links in the conditioned reflexes seems to be unlimited. This greatly increases the scope of his activities. 'A signal to which the animal was previously indifferent acquires executive power; it becomes a spring of further action. It amplifies the animal's behaviour. The new connection improves with use; under disuse it disappears. It can therefore hardly be morphological. Professor McDougall is trying to see if it is heritable. Anyway the great new surface net of the brain is educable. Before it, truly, there were educable systems in the animal world, but this is so educable as to be practically a new thing in the world. In the dog it can acquire these new links even in a few repetitions, and links can be combined even to the third degree. In man it seems they can develop almost without limit' (Sir C. Sherrington). Thus the human brain is capable of being educated almost endlessly. The study of conditioned reflexes also shows the plastic adaptability of the central nervous system by means of which adjustment to external environment occurs.

Another interesting outcome of this work is that it has been found that dogs show marked individual differences in regard to the *facility* with which these reflexes are acquired. In some they are more stable than in others. Some acquire the positive or the excitatory reflexes more easily, others the negative or the inhibitory.

Thus Pavlov divides his dogs into four different groups, namely two extreme groups of markedly excitatory and inhibitory animals, and two central groups of well-balanced, equilibrated animals, but also different—one being quiet and the other exceedingly lively. These results are applied to man, who is said to possess four types of *temperaments*. The ancient grouping of temperaments according to Hippocrates into choleric, melancholic, sanguine and phlegmatic is essentially correct. The excitatory type is the choleric, the inhibitory is the

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melancholic, the phlegmatic type is well-balanced, self-contained and quiet, while the sanguine is also well-balanced and energetic, when there is a constant stimulus but in the absence of a stimulus it becomes slothful. In an extreme case the excitatory choleric type merges into the pathological form known as neurasthenic, and the inhibitory melancholic type into the hysterical. Thus this knowledge also helps us to understand the various forms of psychoses.

In considering the functions of any organ in the body, we as physiologists think in terms of chemical reactions, production of heat, action potentials, exchange of energy, the structure and functions of individual cells. In the case of the brain also, we consider all this. In addition to this we have in conditioned reflexes an objective method of studying some of the responses to stimuli that occur in higher animals. But in studying the functions of the brain, it is impossible to divorce the mental process from the physiological. What is the relation of these two processes to each other? How does one influence the other? Have they both a common origin? Are mind and matter two different things? Pavlov says that they are not. 'We are now coming to think of the mind, the soul and matter as all one, and with this view there will be no necessity for a choice between them'. He thinks that this dualistic theory has kept physiologists from working with the higher nervous phenomena. May it not be that in order to understand fully how the brain works, we require the joint efforts of physiologists and psychologists. It is in order to bring about this liaison that this joint session of the two sections has been held here to-day. I trust, that this liaison will endure to the mutual benefit of both physiology and psychology.

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Medical News

SUMMARY OF TUBERCULOSIS NEWS FOR THE MONTH OF FEBRUARY 1938

THE report of the 10th Conference of the International Union against Tuberculosis has been recently received. The conference was held in Lisbon from 5th to 10th September, 1937, and was attended by well-known phthisiologists from various countries. The reports of Professor Lopo de Carvallo on radiological aspect of the hilum, by Dr. Sachel on primary infection in the adolescent and adult, by Dr. Hatfield and Dr. Powell on tuberculosis prophylaxis in the home, do not merely provide interesting information and define the present scientific status of the problem, but have given new ideas for scientific discussion and further research.

In accordance with the recommendation of the executive committee, the council decided to hold the next conference in Berlin in 1939. The exact dates will be settled later.

The International Union serves a valuable purpose of bringing together nations, which have a common object in prevention, study and treatment of tuberculosis. Forty-four countries are now adherent to the Union. The Union not merely manifests itself by its conferences, it is a permanent body, the activities of which include meetings of the executive committee, an annual meeting, the publication of a quarterly journal, as well as some affiliated activities. The Bulletin is the only bond that unites the members of the Union in the interval between the conferences. It keeps the readers informed about the Union's activities and also to a certain extent reflects the main trend of international phthisiology. Of the several associated activities of the Union, a commission under Dr. Bachmann (Zurich) has issued a very interesting report on the practical solution, which has been reached so far, on the conditions required to make post-sanatorial assistance as effective as possible. The report deals with sanatorium statistics and the conclusions to be drawn from them about after-care work, and discusses the possibility of conciliating the reduced working capacity with a normal salary and gives information about the organization of the rehabilitation and post-sanatorial assistance, and mentions the various solutions that have been realized up to date.

HEALTH LEAGUES FOR VILLAGES: EDUCATING THE CHILDREN OF INDIA

THAT health leagues should be created in every village in India to fight disease and improve the standard of life was urged by Colonel A. J. H. Russell, Public Health Commissioner with the Government of India, in a talk broadcast from Delhi recently.

Dealing with the launching of a rural hygiene campaign, Colonel Russell said: The first point I would make is that no advance can be expected unless the agencies at work, whether governmental or non-official, secure the villagers' active co-operation. It is now generally recognized, indeed, that public health measures thrust on a community by compulsion can never produce permanent results.

This co-operation can only be obtained by preliminary educational work directed towards developing the villager's interest in schemes for his betterment.

Whilst the most fruitful results will probably be attained by teaching the children, the adult must not be neglected, for although the Indian villager does not readily accept new ideas, community life is not unknown to him nor is the ideal of service alien to his outlook.

Successful preliminary work of this kind will make further advance possible through the formation of village organizations whose members devote both time and service to the common good. Members of co-operative societies and non-official agencies, inspired with this purpose, may thus be induced to form health

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leagues for each village or group of villages, whose objects are to develop the ideal of self-help in relation to the care and promotion of their own health.

Patient presentation of facts bearing on the advantages of personal and environmental hygiene—by means of lectures, talks, personal conferences and house-to-house visits—is the first step to be taken in order to arouse in the villager a sanitary conscience, although the great difficulty here is that we are dealing with people who to a large extent have not been conversant with sanitary principles in childhood.

All classes eligible

All classes of the community should be eligible for membership and every individual in the village should be encouraged to make his contribution to the approved health programme. Some will most conveniently make their contributions in the form of money, but the poorer members should be permitted to offer free labour, which has been an age-long custom in many parts of India.

Labour devoted, for example, to the cleaning of the village tank or the excavation of manure pits will be equally acceptable and by such means all sections of the community will have the satisfaction of taking an active part in the betterment of their own surroundings.

The public health officer of the area and other officials should all assist to their utmost; the health officer should, for instance, attend all meetings of the health league when public health measures are being discussed, in order to guide and advise so that waste of effort may be avoided. Once the foundations of confidence and interest are well and truly laid, the superstructure of health improvements should be easy to erect.

As the health unit's activities (a unit comprising a population of about 40,000) should all be based on standard public health methods, a permanent staff of trained workers must be provided. The cost of this staff is the contribution which can be suitably made by the governmental or local authority primarily responsible for the welfare of the population.

Importance of staff

In the first place, a trained and experienced health officer is essential, because the success or failure of the scheme depends largely on his capacity to develop the team spirit in his subordinates and in the villagers, through the health leagues.

He it is who is mainly responsible for the education work to which reference has already been made, but the other members of his staff, which should include four qualified sanitary inspectors, four trained health visitors, eight certified midwives and if possible a woman doctor, must also take a continuously active part in the same task in their respective spheres of action.

One of the first activities that might be usefully undertaken is the prevention of smallpox, which is such a common disease. If the entire population is properly vaccinated, the people can be assured that further outbreaks of smallpox will not occur for several years.

If a survey, on the other hand, reveals that malaria is a major problem, suitable methods of control including mass quininization should be put into practice at once.

In these and other ways suited to the area, the villagers will obtain concrete demonstrations of the value of the health unit scheme and will be the more willing to take part in other activities recommended by the health staff.

Need for statistics

The proper evaluation of all health work depends on the accuracy of vital and health statistics and the health staff must make early efforts to improve birth and death registration and the records of diseases such as smallpox, plague and cholera.

The co-operation of village headmen, school teachers, and revenue officials should be enlisted for this purpose and, if this work is properly handled, the health officer should soon be in possession of accurate details not only of prevailing birth and death rates but of the incidence of every important disease in his area.

Uninformed opinion is often inclined to consider the collection of these records to be a waste of time and money, but the fact remains that no real estimate of progress in public health can be made without them.

'Persuade the women'

I must refer to another important part of a well-planned health unit scheme, *viz*, the care of the mothers and children. This is the main function of the health visitors and midwives, although the health officer himself is also intimately concerned.

In India this work, however, can only be carried on by women, because the majority of homes are closed to men workers. Educated Indian women have so far failed to realize the vast opportunities awaiting them in this field and it is at present impossible to obtain a sufficiency of trained workers.

At convenient centres throughout the area, clinics should be provided at which the mothers can obtain skilled advice for themselves and their infants and young children. By talking to individual women and by demonstrations given during home visits, the health visitors will be able to gain the confidence of the mothers, to induce them to attend at the clinics and to put into practice the advice they are given.

The clinics should be made as attractive as possible, otherwise the attendance will decline. At quite an early stage, it should be possible to gives instructions in sewing, knitting and in the feeding of weak and sick infants, and on every possible occasion carefully prepared talks on different subjects should be a part of the day's programme.

Persuade the women that polluted water, the lack of sanitation and swarms of flies are grave dangers to their children and the health campaign will be won.

200,000 die in child-birth

A moderate estimate indicates that every year about 200,000 women die in child-birth in this country and that no less than 1¼ million infants die before they reach the age of one year. These figures represent an incalculable amount of suffering, pain and loss which is largely preventable and which can only be prevented when women trained in preventive medicine become available.

I believe that by some such organization, working in close co-operation with others of the same kind, satisfactory progress can be made in respect of the public health part of a rural reconstruction campaign.

ANNUAL MALARIA CONTROL COURSE FOR LAYMEN

This course which is intended for non-medical residents in the tropics, home on leave or those about to take up appointments abroad (engineers, planters, etc.), will be held at the London School of Hygiene and Tropical Medicine commencing on Monday, 27th June, 1938, at 10 a.m.

(1) The course will be under Sir Malcolm Watson, Director of the Ross Institute of Tropical Hygiene.

(2) The course lasts five days, and ends on Friday, 1st July, 1938. Except on Friday, 1st July, the lectures of the malaria control course are given in the mornings only; but (in response to numerous requests from those who have attended in the past) additional afternoon lectures and demonstrations have been arranged on (*a*) water supplies, (*b*) conservancy and sewage disposal, (*c*) insulation against heat and cold, air conditioning for comfort in the tropics.

(3) The course is designed for planters and mining engineers, but it will be of interest to all (including missionaries) who are proceeding to the tropics. Doctors may attend, but the course is primarily for laymen.

(4) It includes instruction on mosquitoes and their habits, drainage and other measures for the prevention of malaria. It is illustrated by lantern slides, films,

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demonstrations of the living insect in the various stages of its history, and a practical demonstration on Hampstead Heath.

(5) The course is free. Applications to attend the course should be sent in as early as possible to the organizing secretary at the Ross Institute of Tropical Hygiene, Keppel Street (Gower Street), London, W.C.1.

(6) The most convenient underground railway stations serving the school are Tottenham Court Road, Goodge Street, Russell Square.

(7) Luncheon can be obtained at the school.

INDIAN MEDICAL RESEARCH

THE Indian Research Fund Association will have its annual grant raised from Rs. 1½ lakhs to Rs. 4½ lakhs from next year as a result of certain proposals now under consideration of the Government of India.

The Indian Research Fund Association is a local body established in 1911 for the prosecution and assistance of research, propagation of knowledge and for experimental work generally in connection with the causation, mode of spread, and prevention of diseases primarily of a communicable nature. It has received from the Central revenues ever since its inception an annual grant-in-aid which amounted in 1931-32 to Rs. 7½ lakhs, the total contribution to the Association made by the Government of India so far being nearly a crore of rupees.

RESERVE FUND STEADILY DEPLETED

As a measure of retrenchment that grant was reduced to Rs. 1½ lakhs per annum from 1932-33 and still stands at that figure. In consequence the Association found itself compelled to draw up its research programme on a restricted basis and even then had to withdraw annually a sum of Rs. 3 to 4 lakhs from its invested funds which stood at a little over Rs. 52 lakhs (face value) in 1932-33 and which, as a result of gradual reduction and of the transference of the share of the Government of Burma, will shortly be reduced to about Rs. 31 lakhs (face value).

The reserve funds of the Association were thus in danger of steady depletion to a point where it would have been difficult for it to draw on them in emergency for maintenance of its general research activities.

Though the present increase does not restore the grant to its pre-depression figure, it is believed that this will substantially help the Association in tiding over its financial difficulties.

INDIAN RED CROSS SOCIETY

MISS NORAH HILL, A.R.R.C., organizing secretary, Indian Red Cross Society, and General Secretary, St. John Ambulance Association (Indian Council), has left the Indian Red Cross Society, on termination of contract, after nine years of service in India, at the end of February.

Coming to India as organizing secretary of the Indian Red Cross Society in 1929, she brought with her the varied experience of fifteen years' work for the Red Cross. The widespread activities of the Red Cross in India and its increasing recognition as a national health-building agency are in no small measure due to her energy and organization. Of the numerous schemes initiated by her, mention must be made of the trained-nurses' roll which proved of great value during the recent Bihta train disaster. She is responsible for the cinema section of the Indian Red Cross Society, which has to-day a large library of health films produced by the section itself and bought from other countries. She was awarded the 'Cross of Merit' by the Japanese Red Cross when she visited Japan as leader of the Society's delegation to the International Red Cross Conference in 1934. In the same year she became an Officer (Sister) of the Order of St. John for her untiring work as General Secretary of the St. John Ambulance Association. In 1935, Miss Hill was awarded the King's Silver Jubilee Medal and she received the Kaiser-i-Hind Medal, First Class, in 1937. In May she added the Coronation Medal to her list of international decorations.

She is succeeded by K. B. Dr. Abdul Hamid, D.P.H. Dr. Hamid was one of the assistant directors of public health in the United Provinces, where he also acted as honorary secretary of the U. P. branch of the Indian Red Cross Society for a number of years.

INDIAN MEDICAL COUNCIL

MAJOR-GENERAL H. C. BUCKLEY, K.H.P., I.M.S., is nominated as a member of the Medical Council of India from Bombay, *vice* Lieutenant-Colonel S. L. Bhatia, I.M.S., resigned

Colonel D. H. Kai, I.M.S., is nominated as a member of the Medical Council of India from the C. P. and Berar, *vice* Colonel K. V. Kukday, C.I.E., I.M.S. (retired), resigned.

Colonel H. Stott, O.B.E., I.M.S., is nominated as a member of the Medical Council of India from Bihar, *vice* Major-General P. S. Mills, I.M.S., resigned.

Lieutenant-Colonel P. S. Bharucha, D.S.O., O.B.E., I.M.S., has been duly elected as a member of the Medical Council of India, *vice* Khan Bahadur Dr. K. A. R. Rahman, O.B.E., resigned.

BOMBAY MEDICAL COUNCIL NOTICE

THE Bombay Medical Council will welcome suggestions from registered medical practitioners, medical associations, etc., regarding the revision of the Code of Medical Ethics. The suggestions should be sent to the Registrar, Bombay Medical Council, at 19, New Marine Lines, Bombay.

THE MADURA MEDICAL ASSOCIATION

Tenth Annual Report

THE number of members on the rolls is 78 and shows an increase of 19 over the figures for the last year.

There were eleven ordinary clinical meetings of the association of which one was a joint meeting of The Madura and Ramnad Medical Association held at Madura, one a similar two-districts' meeting held at Ramnad and another at Madura of the Madura, Ramnad and Tinnevelly Medical Associations.

SILIGURI MEDICAL ASSOCIATION

THE medical profession in Siliguri has recently united into an association, with Dr. J. N. Sengupta as president and Drs. J. C. Bhattacharjee and M. N. Biswas as joint secretaries. The membership is open to all allopathic medical practitioners. The secretaries appeal through this journal to all medical men of Darjeeling Terai to join the association.

THE PARKES MEMORIAL PRIZE, 1937

MAJOR J. BIGGAM, M.C., R.A.M.C., has been awarded the Parkes Memorial Prize for his very valuable investigations into the lighting of barracks and other military institutions coupled with important work he has carried out in regard to the effect on vision of the wearing of the service respirator and the designing of a suitable spectacle frame for wearing with the respirator by men with impaired vision.

The Parkes Memorial Prize is awarded annually to the officer who is considered, by the Committee, to have done most to promote the advancement of Naval or Military Hygiene by professional work of outstanding merit, and is open to Medical Officers of the Royal Navy, Army, and Indian Army with the exception of the Professors and Assistant Professors of the Royal Naval Medical College, Greenwich, and of the Royal Army Medical College, London, during their term of office.

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Current Topics

Epidemic of Paratyphoid B Fever

By W. M. FRAZER, M.D., M.SC., D.P.H.
B. T. J. GLOVER, M.D., D.P.H.
and
V. GLASS, M.B., B.S., M.R.C.S., L.R.C.P.

(From the *British Medical Journal*, Vol. II, 21st August, 1937, p. 369)

ON 4th January, 1937, was notified the first of a series of cases of paratyphoid B fever in an outbreak which aggregated 132 primary cases before it was ended, of which 107 cases were in Liverpool, sixteen in the adjoining town of Bootle, seven in the rural districts surrounding Liverpool and Bootle, and two in North Wales. The quick succession of notifications—there were seventeen in the first week and thirty-three in the second week—and the widespread distribution in the city led to an immediate examination of samples of water from both Vyrnwy and Rivington supplies. The results were entirely negative, as indeed had been the results of the frequent routine bacteriological water examinations during the previous two months.

As the cases were notified they were charted on a graph according to their date of onset and entered on a map in accordance with the site of residence of the patients. Two features of the outbreak were quickly discerned—namely, that the majority of the cases had their date of onset at the end of December and beginning of January, and that the south end of Liverpool was escaping completely. One case notified from the south of Liverpool which appeared to be an exception proved to be one of pneumonia.

The history given by the majority of the patients showed that they obtained their milk and/or bread and/or butter, and sometimes other foodstuffs, from the same firm, hereinafter called firm A. Inquiries revealed that firm A traded through many retail shops over an area corresponding with that covered by the outbreak, and that the south end of Liverpool was supplied by an independent branch of the same firm, obtaining its food supplies from different sources. Further inquiry revealed that although some of the patients had eaten butter made by firm A, most of the butter they had purchased was of Empire or foreign origin, and had been delivered to each retail shop in the kegs in which it had been imported, there to be opened and sold in quantities to meet customers' requirements. Attention was therefore concentrated on milk and bread.

Firm A prepares pasteurized and sterilized milk, and sells approximately 8,500 gallons of the former and 1,000 gallons of the latter daily, approximately one-fifth of the milk consumed daily in Liverpool and Bootle. Out of 123 patients from whom a food history was obtained seventy-five consumed milk from this source. The pasteurizing plant is one of the latest design, and is under the regular supervision of the staff of the Health Department because this firm is one approved for the supply of milk to school children under the Milk Marketing Board's scheme. The processing and bottling arrangements are such that the milk is not touched by hand subsequent to pasteurization. It appeared, therefore, to be unlikely that the outbreak was attributable to this particular milk supply. Confirmatory support for this view was, first, that the children affected were not those who were attending the schools supplied by firm A except in a few instances, and, secondly, that the outbreak ought to have been a much greater one if it had been due to the infection of milk which was so high a proportion of the total milk consumed in the city. For these reasons attention was concentrated on the bread baked by this firm. Perhaps it is needless to add that in spite of this conclusion exhaustive inquiries were made into the recent health of the dairy employees, and that steps of a general nature were taken, such as additional care of the hands of the staff and so on.

SOURCE OF THE INFECTION

The bakery is a very large one and is exceedingly well conducted. Out of 123 patients from whom a food history was obtained seventy-six (62 per cent) regularly consumed bread from this source. The output is approximately a quarter of a million loaves a week. As this output is but small fraction of the total number of loaves produced in Liverpool, the very high proportion of patients who ate this bread is significant. Both separated milk and water are used in baking, and although it was thought to be unlikely that anything added to the loaf before baking was the cause of the epidemic, inquiries were made into the sources of both. The water was city water stored in a tank. An examination revealed nothing of significance. The separated milk was efficiently pasteurized before use and was consequently above suspicion.

Observations were made during the night while the staff were carrying out their various duties, and it was noted that twenty employees were engaged in handling loaves after they had cooled, or were touching trays, etc., with which cold loaves would subsequently be brought into contact. It was decided to examine the blood of each of these twenty employees. The blood of five of them revealed the presence of agglutinins. Two had been inoculated with T. A. B. in the Army and in the Naval Reserve respectively, and their blood revealed the agglutinins usually found after inoculation. The blood of two others was positive to *Bact. typhosum* (H) 1 in 20. Lastly a male employee (G. E. T., aged 20), who had not been inoculated and who gave no history of illness like typhoid, either recent or remote, yielded a blood which gave a positive agglutination 1 in 20 to *Bact. paratyphosum* B (H), but was negative 1 in 20 to *Bact. typhosum* (H) and (O), and *Bact. paratyphosum* B (O), *Bact. paratyphosum* A (H), and the Salmonella group. This man was admitted to hospital under observation on 9th February. He proved to be a carrier of *Bact. paratyphosum* B, the organism being recovered from both the fæces and the urine on several occasions.

The patient was discharged from hospital on 27th March.

This carrier had been employed by the firm for two and a half years, for eighteen months of which time he had been handling bread after baking. Except for four days' absence with tonsillitis two years ago there was no illness which prevented him from working. He had had measles when a child, and the only other illness he could remember was an operation on his elbow in May 1933. Inquiries at the hospital where the operation was performed revealed that he was admitted for the investigation of a bone condition which was puzzling, looking neither like malignant disease nor ordinary osteomyelitis. The operation revealed a chronic osteitis of unknown origin accompanied by pus in which no organisms were found. In the opinion of the surgeon the condition was not incompatible with the belief that the abscess was of typhoid or paratyphoid origin.

The carrier had lived all his life with his father and mother. He is the eldest of six children, of whom the youngest is three years old. No member of the family gives any history of having suffered from typhoid fever or any typhoid-like illness.

From a perusal of a chart showing the daily notification of 123 cases in Liverpool and Bootle in which diagnosis was subsequently verified and the dates of onset of the 132 cases which occurred altogether it appears that the average incubation period of paratyphoid fever is twelve days.

It will be observed that there were no cases with a date of infection subsequent to the admission of the carrier to hospital. At the same time it is noteworthy that the epidemic was waning for a month before his admission. There were 118 cases infected prior to 8th January, and only fourteen between the date and 9th February, when the carrier was admitted to hospital.

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This downward trend of the cases after 8th January may be accounted for partly by the increased precautions which were taken by the bakery staff in washing their hands after visiting the lavatory. It was on 12th January that special instructions were given to the staffs of both the dairy and the bakery in regard to this matter. If this carrier was in fact the cause of this outbreak, contaminating the surface of loaves with infection on his hands, it appears to be necessary to assume that the degree of contamination diminished with improvements in personal cleanliness; it may also be necessary to assume that the excretion of organisms in the urine and fæces was intermittent and variable in amount, an assumption not unreasonable in view of the intermittency of excretion during his sojourn in hospital. Unfortunately no attempt was made to estimate the number of the organisms he was excreting. There is a record, however, that a fæcal specimen on 11th February yielded no organisms on direct plating, but that they were found after enrichment. The number of organisms in this specimen must therefore have been small.

Another feature is that 111 cases had been infected (assuming an incubation period of twelve days) before the first notification was received (4th January), leaving only twenty-one cases to be infected subsequently. The infection had reached the great majority of the patients before its existence was suspected.

The even distribution between males and females, not only in the totals but also at different ages, suggests infected food which is consumed by all, irrespective of age and sex. Bread as the infected food is not incompatible with this. Of the three children under one year who were regarded as cases, two were doubtful. The one in which the diagnosis was confirmed by finding the causal organism was a patient whose parents had given it crusts to chew from bread derived from firm A.

Value of fæcal cultures in diagnosis

Out of 124 cases in respect of which there was information on this point, 83 per cent of the fæcal specimens submitted for examination during the first week of illness were positive. The corresponding figures for the second, third, and fourth weeks of illness were that 94.2 per cent, 92 per cent, and 87.5 per cent respectively of patients had positive stools. In the case of patients in their fifth week of illness all the fæcal specimens were positive. The corresponding figures for the sixth and seventh weeks were 75 per cent and 77.7 per cent respectively. The isolation of the causal organism from the stools is of great value in diagnosis even so early in the illness as the first week, and even so late as the seventh week there is a good chance of isolating the *Bact. paratyphosum* B from the first specimen of fæces submitted. Another interesting feature to which attention is called in the paper alluded to is the rate of disappearance of *Bact. paratyphosum* B from the fæces. Fifty per cent of the patients presented positive fæces in the seventh week of illness and 20 per cent were still excreting the organism in the ninth week.

An attempt was made to determine the survival of *Bact. paratyphosum* B on bread crusts. Three experiments were done with the strain isolated from the carrier. A slice half a centimetre thick was cut off the end of a fresh paper-wrapped loaf. This was cut into small rectangular pieces $1/2 \times 1$ cm., which were placed in dry sterile Petri dishes with the crust uppermost. Each crust surface was smeared with a loopful of a saline suspension containing a known number of organisms from an agar culture. The fluid disappeared into the substance of the crust remarkably quickly. The Petri dishes containing the inoculated crusts well separated from one another were stored in a dark cupboard at room temperature. At various intervals after inoculation a piece was removed from the dish and dropped into a tube of tetrathionate broth, any growth subsequently being fully identified serologically. With an inoculum of four million organisms *Bact. paratyphosum* B was recovered from the crust on the seventeenth day but not on the twenty-second or twenty-third day. When only 120 organisms were employed recovery was possible on the sixth day but not on the seventh or twelfth day. In another experiment with six million organisms from a broth culture the crusts still yielded cultures on the thirty-third day, by which time the material under examination was exhausted. It was not possible to be satisfied that any actual multiplication of the organisms occurred in the crust. It is evident that they can remain alive for a considerable time.

Tests to determine the similarity of organisms from patients in the epidemic were undertaken. M. Kristensen and K. Bojlén (1929) have proposed to differentiate five groups of *Bact. paratyphosum* B according to the rate of fermentation of rhamnose, the fermentation of inosite, and behaviour in the Bitter test (1926), which is also dependent on rhamnose fermentation. These tests were made on ninety-five strains from forty-eight cases (including the carrier). All strains fell into the same group, Kristensen and Bojlén group R_2I_1, the features of which are that inosite is readily fermented, rhamnose slowly, and the Bitter test is negative. Eight other strains from four cases not associated with the epidemic fell into the same group.

Course of the illness

Eighty-seven cases were treated in the Fazakerley Fever Hospital, and the following observations are from notes supplied by Dr. A. E. Hodgson, the medical superintendent. With a few exceptions the course of illness was uneventful and free from severe symptoms. Forty-one patients (47 per cent) exhibited a rash and two had intestinal hæmorrhage. There was no example of perforation of the intestine. It was noteworthy that in children the onset was abrupt, with abdominal symptoms simulating an 'acute abdomen'. In three cases the carrier state persisted for a long time. In one case (J. P., female, aged 57 years) the date of onset was 26th December, 1936, and organisms were isolated from the fæces so late as 19th June, 1937. This patient was still in hospital on 21st June. The second case (H. W., female, aged 38 years), with date of onset 3rd January, 1937, was a carrier until 26th May. The third case (H. N., female, aged 42 years), with date of onset 9th January, developed cholecystitis. The gall-bladder was drained and *Bact. paratyphosum* B was isolated (5th June) from the pus.

The part played in diagnosis by bacteriological examination was a prominent one. Out of the 123 cases occurring in Liverpool and Bootle the causal organism was recovered from 111 patients, these specimens being examined in the city laboratory in 109 instances. Of the other twelve cases the diagnosis was confirmed by serological examination in nine instances. In three cases only was the diagnosis made on clinical grounds alone.

There were eleven deaths among the 123 cases in Liverpool and Bootle, a fatality rate of 9 per cent.

Summary

1. An outbreak of parathyroid B fever occurred in Liverpool and Bootle at the end of 1936 and beginning of 1937, with 123 cases and eleven deaths. An additional nine cases in rural districts were also considered to be connected with this outbreak.

2. The circumstances of the rise and decline of the epidemic were not incompatible with the belief that it was due to the infection of loaves of bread handled by a carrier of *Bact. paratyphosum* B who was discovered in a bakery from which was derived the bread consumed by 62 per cent of the patients.

3. The isolation of the causal organism from the stools of patients proved to be a great aid to diagnosis so early in the illness as the first week. Even as late as the seventh week there is a good chance of isolating the organism.

4. Fifty per cent of the patients presented positive stools in the seventh week of illness, and 20 per cent were still excreting the organism in the ninth week.

5. Ninety-five strains of *Bact. paratyphosum* B isolated from forty-eight patients all fell within Kristensen and Bojlén's group R_2I_1.

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6. The survival of *Bact. paratyphosum* B on bread crusts was established. A heavy inoculum (6 million organisms) survived at least thirty-three days, an inoculum of 4 million organisms survived seventeen days, and a light dosage of 120 organisms was recovered on the sixth day.

7. With few exceptions patients made uneventful recoveries. Forty-seven per cent exhibited a rash. In children the onset was abrupt with abdominal symptoms simulating an 'acute abdomen'. Three cases, all adult females, persisted as carriers for five months or more.

Theophylline-Ethylenediamine in Cheyne-Stokes Respiration

By O. A. S. MARAIS, M.B. (Edin.)
and
J. McMICHAEL, M.D., M.R.C.P. (Edin.)

(Abstracted from the *Lancet*, Vol. II, 21st August, 1937, p. 437)

THEOPHYLLINE-ETHYLENEDIAMINE is a combination of one molecule of theophylline with ethylenediamine.

$$\begin{matrix} CH_2\ NH_2 \\ | \\ CH_2\ NH_2 \end{matrix} \longleftarrow C_7H_8N_4O_2$$

Ethylenediamine Theophylline

It was first introduced by Grüter (1910) as the result of a search for a water-soluble theophylline preparation for injection. Theophylline itself is very insoluble, and even the double salt of theophylline with sodium acetate is only soluble in 25 parts of water. Theophylline-ethylenediamine however is quite soluble and easily forms a 40 per cent solution (Grüter, 1936). The ethylenediamine compound was used at first because it was non-toxic, but it was soon found that the compound had pharmacological properties not found in other forms of theophylline.

Theophylline-ethylenediamine is suitably supplied in ampoules and tablets under the trade name of Euphyllin, and it is this preparation which we have used throughout this investigation.

ACTION IN CHEYNE-STOKES RESPIRATION

It is now ten years since Vogl (1927) described the use of euphyllin as a means of abolishing Cheyne-Stokes breathing and the accompanying subjective discomfort. It is surprising, therefore, to find that, apart from a paper by Smith and others (1935) describing its influence on paroxysmal dyspnœa, little mention has been made in English of this effect of the drug. Furthermore, its mode of action in Cheyne-Stokes breathing is still in some doubt, and the elucidation of this problem is our main object. Vogl (1932), summarizing five years' experience with euphyllin in Cheyne-Stokes breathing, states that it never fails to restore the respiration to a normal type. The action is most pronounced in cases of cardiac insufficiency, but is sometimes transient, especially when the periodic respiration results from head injuries or intracranial hæmorrhage.

The following cases will illustrate the action of theophylline-ethylenediamine. In our description the terms 'Cheyne-Stokes' breathing and 'periodic' breathing may be regarded as synonymous, although we use the latter term particularly to include regular periodic waxing and waning of respiration without the true apnœic pauses emphasized in the original descriptions of Cheyne and Stokes.

CASE 1. *Syphilitic aortitis and atheroma.*—A retired ship's fireman, aged 68, complaining of periodic breathlessness, and giving a history of precordial pain a month previously. There was no œdema or general venous congestion, but a good deal of bronchitis and pulmonary congestion. The heart was hypertrophied and a double aortic murmur was audible. The Wassermann reaction was strongly positive, and radiography revealed diffuse dilatation of the aortic arch with calcification. Electrocardiograms showed evidence of recent coronary thrombosis. Cheyne-Stokes breathing was pronounced, but became less obvious after rest in bed for a few weeks when the bronchitis and pulmonary congestion had subsided.

On 31st May, 1937, a single intravenous injection of 0.36 gramme euphyllin abolished completely the Cheyne-Stokes respiration during the course of a slow injection. On subsequent occasions the injection of theobromine sodium acetate (0.6 g.) and of theophylline sodium acetate (0.6 g.) intravenously failed to abolish the periodic respiration. When the latter injection was followed by 0.1 g. ethylenediamine intravenously the Cheyne-Stokes respiration disappeared. On 18th June the administration of 0.5 g. euphyllin by mouth abolished periodic breathing in about ten minutes.

In this patient the effect of euphyllin was maintained over many hours and breathing was often found to be normal in type up to 16 hours after a single dose of 0.48 g. Oral administration was also quite successful.

CASE 2. *Hypertensive heart failure.*—An engineman, aged 53, complaining of breathlessness on exertion. The blood pressure was 170/100, and he presented the usual features of severe heart failure with congestion, *i.e.*, œdema of the legs and back, ascites, enlargement of the liver, pulmonary congestion, and œdema. The patient failed to show any maintained improvement with a succession of therapeutic measures—including digitalis, salyrgan and other diuretics, salt-free diet, and Southey's tubes—and gradually the orthopnœa became more conspicuous and was accompanied by Cheyne-Stokes respiration. Sleep was definitely disturbed by the periodic hyperpnœa, the onset of deep breaths waking him up as he was dosing off to asleep.

On 8th June, 1937. 0.36 g. euphyllin was administered intravenously and a stethograph record showed the abolition of Cheyne-Stokes respiration as the injection proceeded. This injection was given in the afternoon and that night the patient got to sleep with ease, having previously required sedatives. On 11th June the injection of 0.16 g. ethylenediamine intravenously was sufficient to abolish the apnœic phases, but periodic increases and decreases of respiration still persisted. The subsequent injection of 0.6 g. theophylline completed the restoration of the respiratory rhythm to normal. On 14th June theophylline 0.6 g. intravenously alone was without effect and only transient abolition of the Cheyne-Stokes breathing was achieved by 0.16 g ethylenediamine given a few minutes later. On the 15th, 0.48 g. euphyllin intravenously abolished the Cheyne-Stokes respiration completely for two hours.

This series of observations is of interest in that it seems to show that a single injection of the compound theophylline-ethylenediamine may be more effective than its two components given separately in succession. The action of euphyllin on this patient was not so prolonged as in case 1. After the final injection, Cheyne-Stokes breathing had returned in two hours.

CASE 3. *Chronic bronchitis and hypertensive heart failure.*—An unemployed miner, aged 53. Cough, headaches, and breathlessness for five years. For six months he has had attacks of breathlessness which come on as he is falling off to sleep. These waken him and he fights for breath till the attack passes off. There was œdema of the legs; blood pressure 170/110; heart enlarged; no murmurs; rhonchi and crepitations all over the lungs, the latter most marked at the bases; blood-urea 32 mg. per 100 c.cm.

On 22nd June Cheyne-Stokes breathing was pronounced. It was abolished by 0.60 g. euphyllin intravenously, but returned ten minutes after the injection. The action in this case was transient and the patient was not aware of any subjective improvement.

CASE 4. *Rheumatic heart disease.*—A teacher, aged 49. History of severe rheumatic fever when aged 11 but, in spite of known cardiac damage, he was capable of considerable exertion including Alpine climbing. For eight years he has been incapable of such severe exercise, and has become increasingly breathless. Five months before admission to hospital he had influenza and since then he has been orthopnœic. The patient showed slight œdema of the ankles. enlargement of the liver, a tinge of jaundice, and engorgement of the veins of the

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neck up to the angle of the jaw. Blood pressure was 128/60. The heart was grossly enlarged, with systolic and diastolic murmurs at the aortic and mitral areas. The lungs showed œdema at the extreme bases. The patient had pronounced periodic waxing and waning of respiration; he often had attacks of severe breathlessness, particularly at night, which made sleep impossible without morphine.

On 8th June an intravenous injection of 0.48 g. euphyllin was given, resulting in the abolition of periodic respiration. At the same time the patient stated that he could see better, that his mind became clear, and that his breathing became easier and perfectly steady. In his own words 'the difference in breathing was almost unbelievable'. That night he had a long undisturbed sleep without a sedative.

On 10th June a respiratory record was taken to show the effect of the two components of euphyllin. Following the injection of 0.1 g. ethylenediamine the respirations suddenly became very deep and rapid with much subjective distress and anxiety. The condition was regarded by the patient as similar to the nocturnal attacks of dyspnœa which wake him up so frequently. After about two minutes the hyperpnœa subsided, but there was no apnœic pause, the respiration continuing in a steady regular fashion, with complete disappearance of periodicity. A few minutes later 0.6 g. theophylline was given intravenously, with no obvious additional change. After a quarter of an hour he was found to have lapsed into periodic respiration once again. A further injection of 0.48 g. euphyllin was given with the same effect as on the previous occasion, *i.e.*, immediate subjective improvement and abolition of the periodic respiration. That night (four hours later) a stethograph record of the respiration showed no periodicity whatsoever. He had an excellent sleep for seven hours, and was even able to lie flat. Twenty-two hours after the injection the respiration was still regular, but twenty-four hours later the periodic breathing had returned.

The beneficial action of euphyllin in this patient was pronounced and maintained sufficiently long to ensure better sleep than he had had hitherto.

Mode of action

That ethylenediamine stimulates respiration was first suggested by Barbour and Hjort (1920), although acceleration of respiration from the injection of other amines had already been shown, *e.g.*, allyl amine (Piazza, 1915). In the experiments of Barbour and Hjort there was, in addition to the respiratory action, a fall in blood pressure which would be sufficient to account for increased pulmonary ventilation, a fall of pressure in the carotid sinus producing this effect (Heymans and others, 1933). There is thus no conclusive proof from animal experiments that ethylenediamine stimulates the respiratory centre, although Vogl (1932) holds that this is the mode of action of euphyllin. He bases this view on (1) the almost instantaneous action of the drug in Cheyne-Stokes breathing, and (2) its action in rousing comatose patients to wakefulness. Guggenheimer (1932, 1933), however, maintains that the action on respiration is produced mainly by changes in the cerebral circulation, effected by dilatation of the cerebral arteries and aided by increased cardiac efficiency brought about by coronary vasodilatation. Guggenheimer's view is supported by Paul and others (1937) who regard a fall in venous and intrathecal pressures produced by euphyllin as suggestive of an improved cerebral circulation.

It is generally thought that the common underlying basis of Cheyne-Stokes respiration is depression of the medullary respiratory centres. Oxygen-lack, which has been shown by Smyth (1937) to depress the medullary respiratory centre, is probably the cause of the depression in cases of cardiovascular disease such as those described above. On this assumption depression of the respiratory centre may be abolished by euphyllin by one or both of the two suggested mechanisms; (*a*) a direct stimulating action of the drug on the respiratory centre, independent of circulatory changes; (*b*) an increased circulation through the respiratory centre improving its oxygen supply.

(*a*) Direct stimulation of the respiratory centre would be expected to produce the following changes:—

1. Increased pulmonary ventilation, with resulting lowering of alveolar CO_2 tension, and lowering of the CO_2 content of arterial blood.

2. Similar changes should be demonstrable on the normally acting respiratory centre as well as on that depressed by oxygen-lack. If euphyllin caused an increased blood flow through the normal respiratory centre there would result a decreased rather than an increased pulmonary ventilation (McMichael, 1937). Hence an increased pulmonary ventilation in normal subjects would favour the view of direct stimulation of the centre.

The evidence, therefore, of a direct stimulating effect on the respiratory centre is unequivocal. Guggenheimer, however, maintains vigorously that any such action is at least enhanced by an increased circulation through the brain, and it is necessary to consider whether such an effect of euphyllin occurs. To this end we have made measurements of the more important circulatory functions as follows:—

1. *Pulse rate.*—In all cases this remained constant throughout the period of injection and after respiration was restored to normal.

2. *Blood pressure.*—There was no significant change in blood pressure accompanying the euphyllin effect.

3. *Electrocardiographic changes.*—Continuous electrocardiographic records before, during, and after injection were made in case 1. No changes were demonstrable in any of the complexes.

4. *Cardiac output.*—Using Grollman's acetylene method, with all the precautions suggested by one of us (McM.) we have measured cardiac output before and after euphyllin in one normal (J. M.) and one cardiac subject (case 4).

It is seen that there is no significant change in cardiac output with euphyllin, although the respiratory action, determined in the same experiment, was quite striking in both cases. These figures indicate positively that the effect of euphyllin on normal or Cheyne-Stokes respiration occurs in the absence of any demonstrable change in the circulation as a whole.

It might be argued that, without changing the cardiac output or blood pressure, the drug causes a selective vasodilatation of the cerebral vessels altering the distribution of blood in favour of the brain. Such an action would produce a diminished pulmonary ventilation in normal subjects, and we have seen that the opposite effect occurs. There is thus no reason to believe that euphyllin has any local effect on the cerebral circulation.

Therapeutic use and mode of administration

The arrest of Cheyne-Stokes breathing is not solely a matter of academic interest, for its cessation often seems to give a great measure of subjective relief to the patients. It is during the onset of sleep that periodic breathing becomes most pronounced (Harrison and others, 1934). The increased hyperpnœa may be very distressing to the patients and often keeps them awake. Restoration of normal respiratory rhythm may ensure an easy night's rest.

The drug is put up in ampoules of 2 c.cm., each containing 0.48 g. euphyllin. Vogl suggests that it should be given intravenously, and slowly. Half a cubic centimetre is injected as the respiratory movements begin to decline in amplitude, then waiting for the next period of hyperpnœa to decline the second 0.5 c.cm. is given, continuing in this manner until the whole of the 2.0 cm. have been injected. The danger of giving the injection rapidly is that its powerful stimulating action on the respiratory centre may be superadded to the often intense dyspnœa of the hyperpnœic phase. An alternative method is to use the ampoules containing 0.24 g. in 10 c.cm. saline, and give 15 to 20 c.cm. of this solution intravenously, taking at least five minutes over the injection.

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Suppositories are also of some value according to Vogl, but they may be effective only in mild cases. He also states that sometimes irritation in the bowel occurs from their use. Tablets by mouth may be given, but there is a general belief that theophylline may be irritating to the stomach. We have given doses up to 0.5 g. by mouth and produced the desired effect in this way, but in the event of sickness it would be better to keep to parenteral administration.

SUMMARY AND CONCLUSIONS

1. Euphyllin (theophylline-ethylenediamine) has a striking action in abolishing Cheyne-Stokes breathing.
2. Theophylline alone has no effect on Cheyne-Stokes breathing. The effect of euphyllin is due mainly to its ethylenediamine component, but euphyllin may sometimes act when ethylenediamine fails.
3. The effect is produced by a direct stimulation of the medullary respiratory centres, and it occurs in the absence of any demonstrable changes in the circulation.

Minor Rectal Pathology and its Treatment by Injection

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(From the *Medical Press and Circular*, 1st September, 1937, p. 188)

I. INTRODUCTION

HÆMORRHOIDS are of much commoner occurrence than is generally supposed. Patients do not generally consult their medical attendant about this complaint until they have tried all the patent advertisements, followed the advice of all their friends, used a variety of ointments and suppositories, and even consulted osteopaths.

They avoid consulting their regular doctor in the earliest stages, fearing that he will make the dreaded suggestion of 'operation'. Fortunately the lay population is beginning to be aware of the curability of piles by a painless injection which involves no lying-up, no loss of working hours, no nursing home fees, no operation, and no anæsthetic. Thus some patients are tending to consult their doctors in the earlier stage of what they conceive to be piles. This is all to the good—for in this way sometimes an early cancer can be discovered while it is still operable; and if the condition be only one of piles, piles are more easily cured by injections when in their early stages than when the 'third degree' Fissures and pruritus ani are now also amenable to injectional methods.

There is, however, among many practitioners a lack of knowledge of the minor defects of the anus and rectum—so that everything is labelled 'piles'. Many patients have been sent to me with a diagnosis of piles and with a promise of a cure by injection; and when seen, there are no piles, but there is found instead a polyp or a fissure or an external thrombosed pile, etc.

It is the object, therefore, of this paper most briefly to describe (*a*) minor rectal and anal pathology, and (*b*) the technique of the injections of internal hæmorrhoids.

II. NECESSITY FOR AND VALUE OF THOROUGH RECTAL EXAMINATION

(A) *Symptoms are of great value*

(*a*) *Bleeding.*—Internal hæmorrhoids may cause slight to copious bleeding. A fissure only causes 'a streak of blood on the paper'. A cancer may cause slight (or rarely) excessive bleeding. Black, tarry stools do not emanate from piles.

(*b*) *Prolapse* at stool or on exercise, is diagnostic of internal piles or of a polyp.

(*c*) *Constipation:* habit time: is stool hard and lumpy? (a cause of fissures).

(*d*) *Pain*—real pain is diagnostic of a fissure—beginning at stool and lasting for a few hours. Prolapsed piles are only 'uncomfortable'. Of course an external thrombosed pile or a strangulated gangrenous internal pile (either with or without prolapse) is painful.

(*e*) *Itching*—a symptom of pruritus ani, or of external skin tags, chronically soiled with fæces. Hence the necessity for adequate washing after stool.

(*f*) *Mental* depression is a very common symptom—especially in males—of internal bleeding or prolapsing piles.

(B) *Examination*

(1) *Inspection of anus.*—A good light is essential. I find it best to lay the patient on his left side with his head low on a pillow, knees drawn up and buttocks well to the edge of the couch.

Gently separate the buttocks. The following (if present) will be obvious: pruritus ani (perianal dermatitis), external skin tags, internal prolapsed piles, external thrombosed piles, mouth of fistula. If the patient will 'press outwards', and if the operator will gently separate the sides of the anus, a posterior fissure in ano (sometime with pus in it, sometimes with an associated 'sentinal pile') will be seen, if present.

(2) *Digital examination.*—This can easily be done with a thin finger-stall and a lubricant—provided there be no spasm (spasm is frequently present in fissure in ano). The finger must be inserted upwards and forwards, and then upwards and backwards. The insertion of the finger is more easily accomplished if the patient press outwards.

A digital examination will *not* reveal the presence of uncomplicated internal piles, but it will reveal a fissure in ano, a polyp, a strangulated or thrombosed internal pile, and a cancer. The finger should be gently inserted as high as possible.

Much care must be used in *gently* inserting a finger or proctoscope, as otherwise a fissure can thus be caused or aggravated.

(3) *Proctoscopic inspection of rectum.*—Do not use a proctoscope with a bevelled ridge. I use a Kelly's Sphincteroscope, 2½ inches long and ¾ inch diameter at its 'inspection' opening. An electric headlight is necessary and is, I think, better than having the light in the proctoscope itself; for the latter may become soiled by fæces or blood following the first injectional prick.

I insert the well-lubricated proctoscope to its full length and withdraw the obturator. Fæces can be wiped out with wool on forceps. Gradually withdraw the empty tube: if internal piles be present, they will prolapse into the speculum and can be injected (*see* IV below)

(4) *Barium enema, and* (5) *Sigmoidoscopic examination.*—If a cancer be suspected, but is above the area disclosed by the above rectal examination, then methods (4) and (5) should be practised. The symptoms of blood and small calibred stools are important. Loss of body-weight is generally not noticed until late in cases of cancer.

III. RECTAL AND ANAL PATHOLOGY

In this short paper I can only enumerate the conditions that may be found, without elaborating their distinctive features. If the foregoing examinational routine be carefully carried out, there will be no difficulty in making a correct diagnosis.

I shall just indicate the lines of treatment, fuller details of which can be found in my own book.

(1) *External skin tags.*—Unless painful or grossly 'in the way', these should be left alone. Scrupulous cleanliness after stool is essential.

(2) *External thrombosed hæmorrhoids.*—A round œdematous swollen 'reddy-blue" lump will be seen external to the anus covered by *skin*. If small (*e.g.*, not larger than a pea) leave alone and direct the patient to bathe with cold water. Nature will absorb the clot (due to the bursting of the small perianal vein). If large or painful, clean the skin, infiltrate with 2 per cent novocaine (1 or 2 c.c. should suffice). Cut down over clot, evacuate clot, stop bleeding (if possible with pressure forceps alone); partially approximate skin edges, but do *not* stitch. Leave a small, raw, triangular area (devoid of skin) to granulate; thus acting as an

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efficient drainage area, apex of triangle at anus. Apply pressure; bed for 4 to 8 days. Cleanliness. Healing by first intention will result. Obviate future straining at stool by prescribing paraffin, T. D. S.

(3) *Pruritus ani.*—If there be associated internal piles, inject them. In all cases of pruritus ani, adopt the following: (*a*) washing after stool and at night, especially into the rugose folds of skin around the anus, which are always present; (*b*) application of either (1) calamine lotion made with one grain of icthyol to the ounce, and made with 25 per cent witch hazel liquor; or (2) Percainal (Ciba), or (3) ung. phenolein; (*c*) avoidance of causes of localized sweat by bracing trousers and pyjamas *low,* and by wearing silk or cotton locally.

In mild cases the above should suffice. In severe cases the infiltration all around the anus superficially and deeply with 2 to 5 c.c. of proctocaine (or even more) will succeed. Occasionally artificial sunlight (locally) helps. Mental worry is a frequent concomitant and should be removed. I personally have not seen great results from the application of *x*-rays, but this is a personal opinion.

(4) *Mouth of fistula.*—This must be investigated. No injection treatment will help. The whole fistulous track must be laid open by operation. If the fistula be small and unimportant, this is no contra-indication to the concomitant injection of internal hæmorrhoids.

(5) *Fissure in ano.*—Symptoms and signs: pain, beginning at stool, and lasting for half to many hours afterwards; slight bleeding, possibly also a sentinal pile and pus (if the fissure be infected). A fissure often occurs in a neurotic nulliparous woman, but also in all classes. It is due to the passage of a hard scybalous mass which either stretches the anus (tearing it) or tears down a small piece of mucous membrane from inside the anus, which finally hangs outside, thus causing the sentinel pile. In nine cases out of ten a fissure is posterior.

(*a*) *Type without the sentinel pile.*—If early, this can be cured by the patient himself: soft stools to be secured by petrolagar with phenolphthalein—a small dose thrice daily before food; insertion of glycerine suppository before stool; washing gently with cotton after stool; insertion of Sanusin sempoule (British Drug Houses) after stool. Explain to patient nature of trouble and advise him not to overstretch his anus.

If these measures fail, sterilize the outside skin, freeze posteriorly to fissure, insert gloved left index finger into anus and inject—about half an inch behind the anus—2 c.c. of Proctocaine deep to fissure and all around posterior sides of anus. The presence of pus is no contra-indication. The Proctocaine oil must be evenly distributed, not leaving large masses in any one place. The fissure will heal in nine cases out of ten.

(*b*) *The type with sentinel pile.*—The foregoing may be tried, and frequently (although the 'ditch' of the fissure and the sentinel pile remain) it will heal over and the patient have no more pain. He will, however, always have to keep his stools free from scybalous masses and pass soft stools, using paraffin.

In a good many old-standing cases of this type of fissure, Gabriel's operation will be necessary.

(6) *Polyp.*—Quite frequently these can be caught with forceps, pulled upon and ligatured round their base and cut off without any anæsthetic—provided they can be pullled down outside the anus. Otherwise an operation must be performed under an anæsthetic (general, local, or low spinal).

(7) *Cancer.*—If discovered a surgeon's advice must be sought.

(8) *Strangulated and prolapsed gangrenous internal piles.*—If possible replace, and get patient voluntarily to 'suck in' and 'keep in'. Suppositories are very helpful (Proctoids). In a vast majority of cases these entirely subside in two weeks; nature absorbing the clots. Rest in bed is essential. Cold water bathings are helpful. After their subsidence the remaining ordinary piles may be injected. If, however, the mass be large, operative removal is safe and advisable.

(9) *Internal hæmorrhoids.*—These are covered by mucous membrane, are formed by varicosity of the lower hæmorrhoidal veins, and contain running blood. They are found for a distance of about two inches above the anal folds. When large they prolapse, and when the mucous membrane is thin they bleed. Their symptoms are bleeding, 'protrusion' and discomfort. They are only painful and they remain prolapsed for any length of time. Severe pain is almost always diagnostic of fissure or cancer. As stated above, mental depression is very commonly associated with internal piles, particularly in males.

IV. Technique of injection of internal hæmorrhoids

(*a*) *Instruments required.*—Sphincteroscope—already described above. Two long Spencer-Wells artery forceps, for holding swabs or for the control of the very rare bleeding. Long narrow Lane's tissue forceps, for gripping a polyp. Electric headlight and battery in one's side pocket. A movable trolly, a small enamel basin, a dish of cotton-wool swabs, each about the size of a grape, sterilizer, and couch. Ten c.c. graduated syringe—Record type, eccentric nozzle. To the piston is attached a ring for the thumb, and to the cap of the syringe two rings for the index and middle fingers.

The needle is $4\frac{3}{4}$ inches long, it is bent at an angle of about 10 degrees 3 inches from the nozzle. The terminal inch and its point are gold; the remaining part of the needle is corrugated for a revolving screw cap, which, when screwed back, regulates the depth to which one can plunge the needle into the pile; and, when the syringe is not in use, the cap can be screwed forward so as to protect the point of the needle. The needle is affixed by a bayonet catch, so that on pulling the needle outwards (after injection) the needle does not become disconnected from the syringe. (My syringe can be obtained from Messrs. Alfred Cox and Sons, 152, White Chapel Road, London, E.1.)

(*b*) *Fluid to be injected.*—Pure carbolic acid crystals 5 per cent in pure almond oil. The dose is $\frac{1}{2}$ to 2 c.c. into each pile, and not more than 5 c.c. at any one sitting; usually not more than 3 c.c. at one sitting. Other workers have used other fluids, *e.g.,* quinine and and urethane, but I have had far greater success with the above almond oil and 5 per cent carbolic.

(*c*) *The actual injection.*—Instruments must all be sterilized; care must be taken especially that the point of the needle does not touch anything unsterile. An electric headlight is donned, and the patient is put on the couch, lying on his left side with his knees well drawn up, his buttocks (under which are placed cotton wool and a mackintosh) are well to the edge of the couch.

It is only necessary for the patient to expose his buttocks; he may be suitably covered from unnecessary exposure with a towel or rug—attention to such a small point of etiquette is pleasing to a patient, especially of the female sex.

The well-greased sphincteroscope is introduced to its full extent and the obturator removed. Then the sphincteroscope is somewhat withdrawn, pushed in slightly again, and so on, until the piles are in view, having prolapsed in the speculum. The rectum should be empty or swabbed until empty. With forceps in the right hand, swab the field with cotton-wool dipped in lukewarm water (to which is added a drop or two of lysol), holding the sphincteroscope all the while in the left hand. Then pick up the sterile syringe, ready loaded with the fluid, and insert the needle into the lowermost pile. It is better to inject first the bottommost pile in the speculum and then the other piles, if indeed it be intended to inject all at one sitting. If the biggest be injected it will occupy the whole lumen, blocking the others from view; personally I consider that not more than three places should be injected at one sitting.

The needle must be inserted into the pile, *i.e.,* a bulging part covered by mucous membrane; if this be done the patient should not feel the needle prick. Avoid any obvious vein. It is essential that the needle be inserted into the centre of the pile mass; the feeling to the operator should be like plunging the needle into the midst of a jelly. If anything harder be encountered

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the needle should be withdrawn. Then inject slowly; gradually the pile will go whitish and swell up; it is much better to inject too little (especially at the first sitting) than too much. Stop when the pile begins to swell and to go 'whitish', or even before that.

An average injection per pile will be from 1 to 2 c.c. of the oil, but experience in time decides each case; ½ c.c. is a safe small dose. Hold the needle in position for one to two minutes, then withdraw it slowly. On the removal of the needle sometimes a slight ooze of oil from the puncture will be noticed; a slight bleeding may also occur. These cease when the speculum is removed.

It is very rarely (especially with the oil treatment) that bleeding is troublesome; very rarely a bleeding point has to be squeezed by the long artery forceps, and pressure for one minute suffices in all cases without any ligature. This pressure is not felt by the patient, who does not, in fact, know what is going on, for his pile is anæsthetized by the carbolic. The injections having been made, the sphincteroscope is removed, preferably by first re-inserting the obturator; and after the patient's external anal region has been cleansed, and after two or three minutes on the couch, he can get up and go home.

The whole operation is performed in less time than it takes to describe. There is no pain to the patient, his only slight discomfort is the introduction of the speculum; and, if it be well lubricated, its introduction is no more painful than putting one's finger into one's mouth.

The essential practical points are, therefore, do not inject too much, do not inject too low, and only inject into an internal pile, and not into healthy rectal wall. Always inject through the speculum, and never inject an internal pile while it is prolapsed.

(*d*) *After-effects and results.*—It is best for the patient to rest in the recumbent position for about three hours on his return home. About 85 per cent of patients experience an aching in the rectum which lasts for three to four hours; 10 per cent have no discomfort at all; and in about 5 per cent of cases the pain is severe—lasting for twelve hours. Patients should be directed to 'draw inwards', and to keep their piles inside. If they should prolapse after injection they should be bathed with cold water and replaced by the patient. I generally insert a 'Proctoid' suppository after injection. The patient can do his usual work on the day after the injection, but unnecessary or strenuous exercise should be interdicted for three or four days. Patients should take paraffin or Agarol three times before meals during treatment; bowels may be moved on the day after injection.

In 90 per cent of cases the patient will return for the next injection (in a fortnight's time), stating that there has been no bleeding and no protrusion, and with marked signs of gratitude.

Injections should be continued until no more prolapse can be seen within the inserted speculum. An average case of *first* degree piles (which bleed but do not prolapse) can usually be cured in three visits; a case of *second* degree (piles which bleed and prolapse, but which can be replaced and kept replaced), in four or five visits. *Third* degree piles are sometimes better operated on, but even here great improvement can be effected by injection. Experience here will decide: there are really exceedingly few cases that need operation.

If the patient will always henceforward attend to his after-care and rectal toilet and hygiene, the cure by injection is as permanent as with surgical removal. The patient must be directed to practise quickly, 'pressing in and out' several times daily for the rest of his life (beginning a few days after injection). Regular habit time. Soft stools—secured, if possible, by brown bread and fruit and exercise, otherwise by paraffin or Agarol. Washing after stool.

V. SUMMARY

In this paper rectal pathology has been described, together with a simple but exhaustive method of rectal examination. Apart from the treatment of cancer and certain cases of fistula and fissure which need operative treatment, all cases can be dealt with by injectional and other means—all within the scope of general practice.

In particular, an injectional method is described whereby bleeding or prolapsing internal piles can be cured safely, quickly, painlessly and cheaply; with no lying-up on the part of the patient, no risk of anæsthetic, no loss of wages, no nursing home fees; and the gratitude of the patient is extreme.

The Milk Problem: A Critical Study of its Nutritional, Hygienic, Economic and Social Aspects

By H. C. BENDIXEN, G. J. BLINK, J. C. DRUMMOND, A. M. LEROY, and G. S. WILSON

(Abstracted from the *Bulletin of the Health Organization, League of Nations*, Vol. VI, No. 3, June 1937, p. 371.)

NUTRITIONAL

1. A distinction is drawn between animals with a high milk-producing capacity and animals producing milk with a high butter-fat content. Both these characteristics are desirable, and are found together in certain stocks.

2. There is an important relationship between the number of cows in the herd and the cleanliness and safety of the milk produced. A farmer possessing a small number of cows yielding a considerable quantity of milk is in a better position than a farmer possessing a larger number of cows yielding a smaller quantity of milk. In the first place, he will spend less time over the actual milking and will therefore have more time in which to attend to the sanitary conditions of production. In the second place, the smaller the number of cows there are in the herd, the less likely is disease to spread if it is introduced, and the less costly will be the replacement of diseased animals.

3. In general, too little attention is being devoted to the proper feeding of dairy cows. Without an adequate diet, the cow, however carefully selected, cannot produce the maximum quantity of milk and butter fat of which she is capable. An output in any one month more than 10 per cent less than that in the preceding month strongly suggests that the diet of the animal needs readjustment.

4. There is at present a considerable difference to be found in the data contained in the feeding charts for milch cows in various countries. To avoid unnecessary confusion, it would be of value if an agreement could be reached between scientific and practical experts on the food units to be recommended. In this connection, the method of forage equivalents seems to have strong claims for general adoption.

5. There is a close relationship between the constitution of the animal ration and the value of the milk as a human food. In order to secure milk with 'protective' properties, producers should include in the diet a sufficiency of vitamins A and D, particularly during the winter months. This may be done by providing the animals with ensilage, feed carrots, dried grass prepared under conditions involving no loss of carotene, and, if necessary, with vitaminized products, such as irradiated yeast.

6. For many reasons, it would be desirable to produce a milk of standard nutritive quality for consumption in any given country. The definition of such a standard is open to discussion. The main nutritive qualities of milk for human beings are the following:—

(*a*) The fat content, which has the greatest influence on the energy value of the milk;
(*b*) the nitrogen content, which is of extreme importance in human physiology;
(*c*) the content in mineral salts, which is of particular importance for the proper development of the growing child;
(*d*) the vitamin content, which is likewise of considerable importance in growth and in the prevention of disease.

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There is a close relationship between the fat content and the nitrogen content of the milk and there is therefore a strong reason for producing milk with a high fat content. For human consumption, however, such a milk is not altogether desirable, partly because it may cause indigestion in infants and young children, and partly because the increased cost of its production must necessarily be reflected in a higher cost of sale. A milk with too low a fat content is also undesirable, partly because it is too poor in nitrogen, and partly because it conduces to fraud by the producer or the distributor. Clearly a compromise has to be reached, and at the moment we are of the opinion that producers should concentrate on producing milk with a fat content of between about 3.5 and 4 per cent. If it should be found later that the vitamin A and D content is highly correlated with the quantity of fat, it may be necessary to reconsider this recommendation and raise the maximum quantity of fat desirable.

7. The more extensive use of *separated milk* has been advocated by the Technical Commission on Nutrition of the League of Nation's Health Organization. At present, large quantities of this type of milk are available at butter factories at a price that is extremely low. Since separated milk contains the nitrogen, carbohydrate and mineral fractions, it has a very high nutritive value for human beings. At first sight, therefore, there is a strong case to be made out for its increased consumption. On further examination, however, difficulties appear in the practical realization of this policy.

So far as large towns are concerned, the difference in cost to the consumer between whole and separated milk will not be very great. Approximately 50 per cent of the retail price of whole milk is due to transport, processing and distribution charges. The same charges will be necessary for separated milk, and, by the time it reaches the consumer, its cost will probably be not more than 40 per cent below that of whole milk. For this price, the consumer will receive a milk with only 54 per cent of the calorific value of whole milk. It may be pointed out that the whole tendency of modern milk production is to concentrate on the provision for the public of only one or two classes of milk. In this way, it is possible for the large distributing companies to cut down their costs, and so supply the public with a good quality whole milk at a price less than would be possible if several different grades had to be provided.

The cost might be somewhat reduced if the milk could be filled into quart-size bottles, and distributed to certain centres where the people could come and collect the milk themselves. Under these conditions, it is estimated that, in London, separated pasteurized milk could be provided at 3*d*. a quart—approximately half the price of whole milk.

Since, as already mentioned, separated milk has only a little over half the calorific value of whole milk, the only justification for advocating its sale would be to encourage the purchase of separated milk by those who otherwise would buy no fresh milk at all. If the poorer sections of the population could be educated to give separated milk as a drink to their children in place of tea flavoured with condensed milk, and to use separated milk in considerable quantities in the preparation of cocoa, rice puddings, and so on, then a very real benefit might result. It is difficult to tell, however, whether separated milk would find a ready sale. Our own opinion is that the experiment is worth trying.

If it is objected that the dietary of such persons will contain too little butter fat, it may be observed that it is much cheaper to buy butter fat in the form of butter than in the form of liquid milk. In Great Britain, for example, one pound of butter fat costs 2*s*. 8*d*. in liquid milk and only 1*s*. 10*d*. in butter, or even less if Empire butter is used.

In country districts and in small towns, the transport costs would be, as a rule, very much less, though it might be difficult to arrange for adequate pasteurization of the separated milk to be carried out.

An alternative method would be to supply separated milk in dried form. Since the milk could be processed at the butter factory itself or in its near neighbourhood, the heavy transport charges of the liquid milk would be avoided. The final product would have a high nutritive value, would contain in almost undiminished quantity the very important B_2 (lactoflavin) vitamin, would cost remarkably little, could be used for a variety of purposes, and would be less liable to compete with whole milk than when distributed in liquid form. The strong objection, however, of most people to the slight trouble involved in preparing dried milk for the table would probably result in its restriction to special centres, schools, kitchens and institutions.

HYGIENIC AND ECONOMIC

8. It is important to distinguish between the terms 'clean' and 'safe' in relation to milk. *Clean milk* is milk that is free from extraneous matter, such as manure and dust, from blood, and from an undue number of leucocytes and bacteria. *Safe milk* is milk that is free from bacteria capable of giving rise to disease in man or animals. For human consumption, milk ought to be both clean and safe.

9. In general, production of milk on the farms should be under agricultural and veterinary supervision, and distribution of milk under medical supervision. On the farms, the agricultural authorities should supervise the cleanliness of milk production, and the veterinary authorities should ensure as far as possible that the milk is supplied only by healthy animals. Once it has been produced the milk should be supervised by the medical and sanitary authorities, who should watch over the whole process of distribution.

10. In order to obtain the best results, the various activities of the agricultural, veterinary and medical authorities should be closely integrated. Probably the best method of arriving at this end would be the establishment in each country of a Permanent Milk Commission, preferably on a national basis. Such a commission should comprise not more than six or eight persons, representing the interests of producers, distributors and consumers, as well as of the agricultural, veterinary and medical professions. Among the more important duties of the Commission would be the endeavour to harmonize the conflicting interests of the milk industry, to do everything in its power to improve the quality of the milk supply, and to draw up a national milk policy designed to eliminate wasteful methods of production and distribution, and so provide the public with a plentiful supply of clean and safe milk at the lowest possible cost. In some countries, it might be advisable to establish sub-commissions on a regional or municipal basis, in order to exercise control over the production and distribution of milk in their areas.

11. The production of clean milk depends more on scrupulous care in technique than on the possession of expensive buildings and equipment. Nevertheless, a good technique is difficult to maintain without adequate facilities, and the production of clean milk must always entail a certain minimum expenditure both in outlay and in running costs.

12. Unsterilized utensils contribute more than any other single factor to the bacterial contamination of milk on the farm. Special care should, therefore, be devoted to the proper sterilization of milking equipment, either by steam or by chlorine.

13. Dairies and collecting stations that receive milk in churns should return these churns to the farms in a properly cleansed and sterilized condition. In some countries, particularly in districts where the milk is made into butter, it is a common practice to remove the cream and return the separated milk and butter milk to the farmer in the churns in which the whole milk was received. Similarly, in cheese-making districts, the whey is often returned to the farm. Since the separated milk, butter-milk or whey is usually swarming with bacteria by the time it reaches the farm, the churn containing it is not in a fit condition to receive a fresh supply of whole milk. The remedy for this particular state of affairs would appear to be the provision of a double set of churns, one for the whole milk and one for the by-products.

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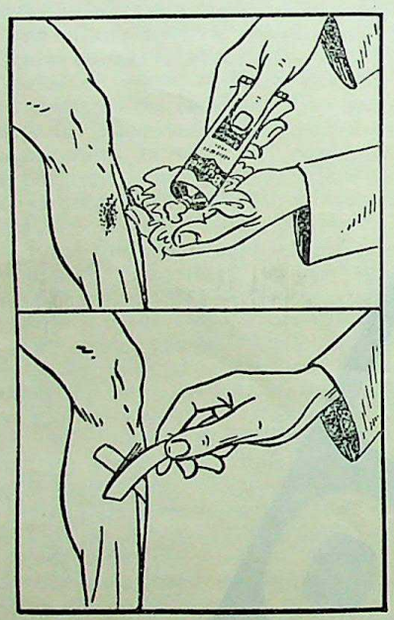

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14. Far too little attention is being paid to the cooling of milk on the farm. No matter how carefully it is produced, milk should be cooled immediately after leaving the cow to as low a temperature as possible. Unless milk is cooled, and kept cool, bacterial proliferation will take place, the keeping quality of the milk will diminish, and toxic products may be formed, even by non-pathogenic bacteria, that are capable of giving rise in infants and young children to gastric disturbance and diarrhœa.

15. In most countries of Europe, extensive disease prevails among the cattle. So far as milk hygiene is concerned, the three most important diseases are tuberculosis, contagious abortion and mastitis. Generally speaking, the spread and gravity of these diseases have gone hand in hand with the development of intensive milk production.

16. Milk frequently contains pathogenic organisms derived from (*a*) the diseased udder of the cow, or, occasionally, the cows' fæces or uterine discharge; (*b*) a human case or carrier, the infection usually coming from the nasopharynx or the intestine, and gaining access to the milk by sneezing, coughing, etc., or by contaminated fingers; (*c*) a contaminated water supply; (*d*) sometimes perhaps from rodents.

17. For a large number of reasons, the extent of milk-borne disease is extremely difficult to ascertain, and all our estimates probably err greatly on the conservative side. In any country, the amount of recognized disease is proportional to the zeal with which it is sought for.

During the years 1912–1935, records are available in Great Britain of the occurrence of 103 milk-borne outbreaks of scarlet fever, septic sore-throat, diphtheria, typhoid fever, para-typhoid fever, dysentery and gastro-enteritis, affecting about 12,000 persons. During the same time, it is estimated that about 150,000 persons contracted tuberculosis of bovine origin of which over 60,000 died, while an unascertained number, probably several thousands, suffered from undulant fever due to infection with *Br. abortus*.

Our information for other countries is even less complete than that for Great Britain, but, such as it is, it points to the existence of a considerable amount of milk-borne disease, much of which is at present being overlooked. In Denmark, for example, where serious attention has only recently been devoted to the investigation of this problem, approximately 10 per cent of all deaths from tuberculosis appear to be due to infection of bovine origin. About 500 cases of undulant fever occur annually, of which a considerable proportion is due to the consumption of infected milk. In addition, during the three years 1934–36, nine outbreaks of epidemic milk-borne disease have occurred, affecting over 10,000 persons.

Over and above these well-recognized infections, there are a number of other milk-borne diseases in which intoxication rather than infection appears to play a major part. Such conditions comprise epidemic nausea and vomiting, some types of acute gastro-enteritis, and summer diarrhœa of children. With the exception of certain cases in which the toxic principle is derived from the cow's food, these conditions appear to result largely from the inordinate growth in the milk of certain relatively non-pathogenic bacteria.

18. Butter and cheese probably play very little part in milk-borne infections, the great majority of which are due to the consumption of raw milk and cream.

19. Attempts to render milk safe for human consumption may be considered under three headings: (*a*) control of animal disease; (*b*) control of the human personnel; (*c*) destruction of pathogenic organisms in the milk by pasteurization or other form of heat treatment. These may be considered *seriatim*.

20. *Control of animal disease.*—(*a*) Whenever possible, the eradication method should be used. The general principle of this method consists in the detection and elimination of all infected animals—not merely of those that are obviously diseased—and the building-up of a healthy herd from the young, non-infected stock.

(*b*) Any campaign to eradicate animal disease should be carried out in the economic interests of the farmer, and should be based on the assumption that a healthy herd is more profitable than a diseased herd. As a rule, State subsidies will be required. Bonus payments to the producer for milk from disease-free herds afford an excellent stimulus to the farmer, but on no account should the conduct of the campaign be made contingent on the payment by the consumer of a higher price for milk from such herds.

(*c*) The amount of animal disease is so extensive, and the difficulties of combating it are so great that, except in certain limited areas, there is no hope in our generation of providing the human population with milk from healthy herds. However desirable, therefore, the control of animal disease may be on other grounds, it cannot be regarded as affording an immediate solution to the public health problem of protecting the consumer against the risk of milk-borne disease.

21. *Control of the human personnel.*—The part played by medical inspection of the human personnel handling the milk is in many ways analogous to that of routine veterinary inspection of the animals producing the milk. Even when carried out thoroughly, with concurrent bacteriological examination, it can never be trusted to detect all cases and carriers of infectious disease. There are, however, conditions in which medical inspection of the personnel is indispensable; for instance, where the milk is to be drunk raw, medical and bacteriological control of all persons handling the milk in the course of its production and distribution should be insisted upon. A similar control should likewise be exercised over all human operatives in pasteurizing or other plants in which large volumes of mixed milk are being handled, so as to prevent any possible danger of contamination of the milk after processing.

22. *Destruction of pathogenic organisms in milk by pasteurization.—No raw milk can ever be regarded as completely safe for human consumption.* Even if produced from healthy animals, milk is so subject to contamination from human and other sources that it must always be regarded in the raw state as a potentially dangerous article of food. The only satisfactory method of ensuring the final safety of the product is to submit it to some form of heat treatment that can be relied on to destroy any pathogenic organisms that may be present. *It is our considered and emphatic opinion that all liquid milk for human consumption should be adequately pasteurized or boiled.*

The term 'pasteurization' covers a number of different processes. Whichever process is used, it is desirable that (*a*) the milk for processing should be produced under hygienic conditions, and should conform to a given pre-pasteurization standard of bacteriological cleanliness; (*b*) the processing should be carried out in properly designed apparatus, free from structural and mechanical defects, by skilled and conscientious operatives who fully understand the rationale of the method they are using; (*c*) the operatives themselves should be under medical and bacteriological supervision so as to avoid the possibility, through negligence or a mechanical breakdown, of contamination of the bulked milk from a human case or carrier; (*d*) the efficiency of the processing should be controlled by suitable chemical and bacteriological tests; (*e*) after pasteurization, the milk should be cooled to a low temperature and filled automatically into sterilized bottles or other containers which are immediately sealed; (*f*) the milk should be kept cooled or refrigerated until its delivery to the consumer; (*g*) at the time of delivery it should conform to a given standard of bacteriological cleanliness; (*h*) the whole process should be carried out under the strictest supervision of the medical and sanitary authorities. Under these conditions pasteurized milk can be guaranteed to be safe for human consumption. At the present time, in many countries, the control over pasteurization is far too lax. If pasteurization is to be recommended as the chief measure for protecting

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the public from milk-borne disease then no effort must be spared to ensure that the process is carried out efficiently and that subsequent contamination of the milk is avoided.

24. Though many pseudo-scientific objections have been advanced against it, we have been unable to find any that is supported by adequate evidence. On the other hand, there is a considerable amount of evidence to show that, when pasteurization has been introduced on a large scale, milk-borne disease has been practically abolished. There is reason to believe that, if pasteurization was rendered compulsory for all towns, infection derived from milk would be completely prevented. In country districts, where compulsory pasteurization is impracticable, insistence should be laid on the necessity of boiling milk prior to consumption.

25. Where there is a special demand for raw milk this should be satisfied by the provision of milk which is derived from herds free from tuberculosis, contagious abortion and mastitis, and which is produced and distributed under stringent veterinary and medical control.

26. Careful consideration has been given to the minimum hygienic requirements for milk destined for human consumption.

There are two main questions involved. On the one hand, it is desirable to provide the public with the maximum quantity of milk at the lowest possible cost. On the other hand, it is essential to take the strictest hygienic precautions in the production and distribution of milk if milk-borne disease is to be avoided. It might be thought at first that there is a sharp antagonism between these two proposals, but this is more apparent than real. Experience in many countries has shown that a well-organized company can collect, pasteurize, bottle and distribute milk of a high standard of cleanliness and safety at a cost only slightly in excess of that demanded by the small producer who sells his own milk unbottled and in a potentially dangerous condition. Though bottling undoubtedly increases the cost of milk to a slight extent, it has very great compensating advantages. Not only does it conduce to greater cleanliness and safety, but it tends to reduce the number of milk distributors in any town or district, and thus to eliminate the wasteful overlapping that at present so frequently occurs. We are of the opinion that the right course to pursue is to concentrate on the production and sale of milk under good hygienic conditions. This will involve a demand for clean milk production, pasteurization and bottling. Such a policy will, we believe, be successful in increasing the quantity of milk consumed by the public, since the guarantee of security that it will afford will more than counterbalance the slightly lower price at which dirty and often unsafe milk is sold in many cities. Loose unbottled milk, besides being unhygienic, opens the way to fraudulent practice, and the loss suffered in this way by the small consumer may be greater than the slightly increased price that he will have to pay for properly bottled milk.

27. The milk of producers should be graded and paid for on the basis of quality—fat content, cleanliness, and freedom of the herd from disease. No substantial improvement in the quality of the milk supply is to be expected unless an economic stimulus is afforded to the producer for the extra trouble and expense involved. In order, however, to avoid the difficulties of isolated bonus systems and of fraudulent practice among buyers, it is important that *all* milk should be paid for according to its quality, and that the payment should be under the control of a regional or national Milk Commission.

28. Milk for consumption, on the other hand, should not be graded. The best milk available should be directed to the liquid market, and only this milk should be offered to the public. Grading of producers' milk is highly important; grading of milk for consumption has no particular value, and merely confuses the public. The sale of milk under special names, such as children's milk, certified milk, preference milk, tuberculin-tested milk, and so on, should be discontinued.

29. All milk for human consumption should be placed under much more rigorous laboratory control than is at present generally practised. In general, the milk of every producer should be tested at weekly intervals for bacterial cleanliness by a simple test such as the modified methylene blue reduction test. Summer and winter standards of cleanliness should be laid down, and any producer whose milk fails to reach the given standard in at least 75 per cent of tests throughout the year should be prevented from supplying milk to the liquid market. Pasteurized milk furnished by distributors should be tested even more frequently in order to maintain a high standard of processing. For this purpose, the phosphatase test appears to be best suited for the control of holder-pasteurized milk, and the Scorch test for milk pasteurized at a high temperature. Distributors whose milk is shown to be inadequately pasteurized on more than exceptional occasions should have their licence revoked.

30. In general, the producer pays too much attention to the selling price of his milk and too little to his costs of production. This applies particularly to countries like Great Britain, which do not have to compete with other countries in the export market. There appear to be several possible ways of lowering the costs of production, and we recommend that producers should devote serious attention to this subject. There is reason to believe that if the cost of liquid milk could be appreciably lowered, there would be a substantially increased demand for it.

31. So far as towns are concerned, the distribution of milk including such operations as collection from the farms, cooling at a central receiving depot, transport to the town, pasteurization, cooling, bottling, refrigeration and final delivery to the home of the consumer is rapidly assuming an importance far greater than that of simple production. A large distributing business has to arrange for the disposal of surplus milk, and may have to build its own factories to turn it into butter, cheese, condensed milk, dried milk, and so on. Distributors of this type can no longer be regarded as simple middlemen; they constitute an essential part of the dairy industry. The efficient distributor is often faced with unfair competition from other less efficient firms. The most satisfactory way of avoiding this is by the introduction of legislative measures, which not only insist on a high standard of quality of the final product, but which lay down definite hygienic requirements to be complied with during the actual process of production.

32. We believe that the future of the dairy industry lies in the gradual elimination of the small and often inefficient distributor, and its concentration into the hands of large, well-organized firms which are making use of every aid that science can offer them to improve the technical efficiency of their business and the high quality of their products. Just as during the past century the water supply of our large towns has passed out of the hands of multiple small producer-retailers into the hands of large concerns, controlled by the municipality, a public utility company, or some similar body, so, in the future, we believe that milk for human consumption in the liquid state will come to be regarded more and more as an article of food over which such care has to be exercised that none but large and efficient organizations will be allowed to handle it.

SOCIAL

33. Any nutrition policy designed to secure a rational diet for the population as a whole, and hence to adapt the consumption of milk and milk products to the requirements of health, must be based on a detailed study of family budgets. The place of milk in any such nutrition policy must depend on the nature and quantity of other articles in the dietary.

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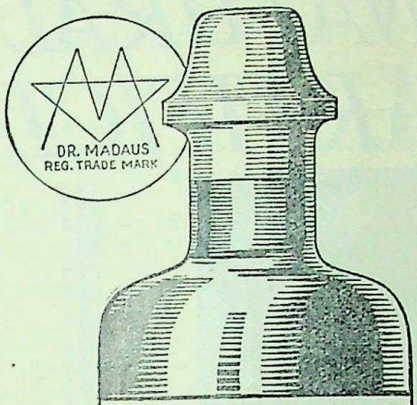

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NATURAL OR ARTIFICIAL?

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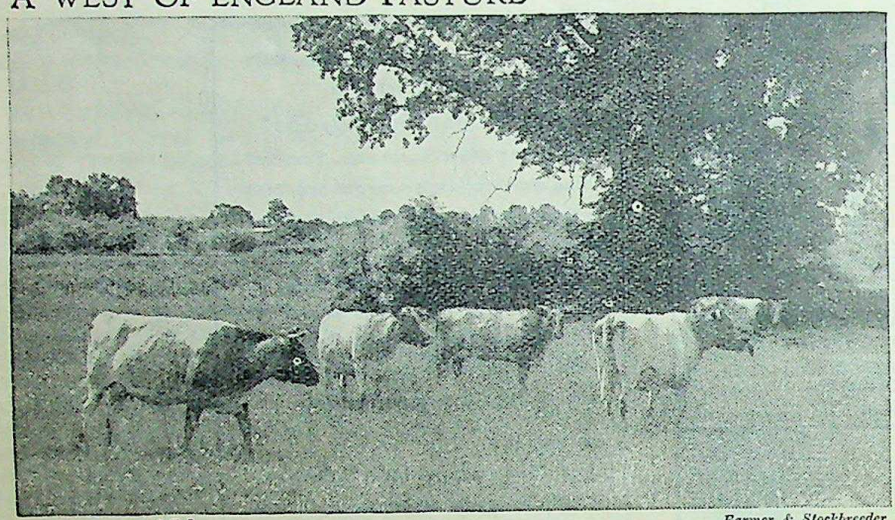

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Steenbock, the American pioneer of the irradiation process, has also admitted (Jnl. Biol. Chem., July 1932) that:

"Ergosterol and yeast when activated anti-rachitically by ultra-violet radiations are inefficient sources of vitamin D for the chicken. Whereas one per cent. of cod-liver oil of average potency resulted in normal bone formation, it required from 40 to 120 per cent. of cod-liver oil equivalence as irradiated ergosterol *and from 7.5 to 60 per cent. cod-liver oil equivalence* as yeast *to produce the same result."*

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34. The consumption of milk and milk products increases directly with the size of the income and inversely with the number of members in the family.

35. So long as the relation between prices and the purchasing power of various population groups renders it impossible for everyone to obtain sufficient milk and milk products, so long will social measures be necessary to ensure a greater consumption of these articles, particularly by pregnant and nursing women, infants, children of pre-school and school age and unemployed or indigent persons. Among the various measures to increase milk consumption, we recommend the grant by the State of subsidies for the provision of milk to schools, to pregnant women, nursing mothers, etc.; facilities for the provision of milk in factories, offices, restaurants, railway stations, etc., and the encouragement, by the institution of school meals, such as the so-called Oslo breakfast, of an increased consumption of other dairy products, particularly butter and cheese. Of these measures, we regard the milk-in-schools scheme and the Oslo breakfast as worthy of special commendation.

36. Though propaganda may have some value in increasing consumption, we believe that its effect is liable to be over-estimated. The best possible method of propaganda is the provision of a supply of clean and safe milk in which the public can have perfect confidence.

Reviews

PRACTICAL PROCEDURES.—Edited by Sir Humphry Rolleston, Bt., G.C.V.O., K.C.B., M.D., F.R.C.P., and A. A. Moncrieff, M.D., F.R.C.P. 1938. Published on behalf of The Practitioner (5, Bentinck Street, W.1.) by Messrs. Eyre and Spottiswoode (Publishers), Limited, 6, Great New Street, E.C.4, London. Pp. 293. Illustrated. Price, 10s. 6d.

IN his introduction to this book Sir David Wilkie takes the view that the general practitioner of to-day is tending to encroach on what were hitherto the preserves of the specialist, and is now beginning to carry out special procedures himself. This is a very healthy sign for the practice of medicine in the future, as there was a distinct danger that the practitioner would become little more than a sorting clerk or guide to direct people to the right kind of specialist. Twenty-five years ago the physician, even the fashionable London physician, seemed to be afraid to use a serum syringe; just before the war the reviewer knew an eminent pathologist, the most remunerative part of whose practice consisted in giving neosalvarsan to patients sent to him for the purpose by both physicians and surgeons.

Some of the titles of the chapters in this book are —'Plaster of Paris Technique', 'Indications and Technique for Blood Transfusions', 'Estimation of Blood Pressure', 'Local Anæsthesia', and 'Lumbar Puncture in General Practice'; this gives one an idea of its scope and value to the practitioner. Each chapter is contributed by a well-known specialist, physician or surgeon, who has had a wide experience with the particular 'practical procedure'.

The chapter on blood transfusion is a comprehensive one including details of blood grouping and direct matching, as well as the actual technique of the transfusion. The writer favours the giving of citrated blood and thinks that the advantages claimed for giving whole uncitrated blood are doubtful and certainly not commensurate with the difficulties and dangers. Dr. Lionel Whitby writes on the interpretation of blood examinations and on the technique of blood counts. He mentions the halometer and issues a warning that its use does not constitute a short cut to the diagnosis of anæmias and that it is not a substitute for the hæmatocrit: we agree but should have expressed it more strongly.

We do not feel confident that Sir David Wilkie's optimism regarding the practice of medicine is as applicable in this country as it is in Great Britain to-day, but we hope it will be so very soon, and, if this useful little book is read widely, it will certainly do much to hasten this healthy change in general practice in India.

L. E. N.

MEDICAL DIAGNOSIS. THE GENERAL PRACTICE SERIES.—By S. L. Simpson, M.A., M.D. (Camb.), M.R.C.P. (Lond.). 1937. H. K. Lewis and Company, Limited, London. Pp. lx plus 244. Price, 10s. 6d.

As the name of the series suggests, this book is very much more suited to the practitioner than to the student. Again, even for the practitioner it is more valuable for general reading than as a reference book.

The book is divided into chapters in which for the most part one 'system' is dealt with, but there are other chapter headings such as 'Specific Infectious Fevers' and 'Children'. In each chapter, after a short introduction, each disease state is given a small section with a clear heading, such as colitis, diverticulitis, renal calculus, encephalitis lethargica, splenic anæmia, etc., but there are also symptomatic headings, such as diarrhœa, constipation, and vertigo; this doesn't seem quite consistent.

However, the book provides quite pleasant and very informative reading for the physician who wishes to improve his diagnostic acumen.

PHYSIOLOGICAL PRINCIPLES IN TREATMENT.—By Sir Walter Langdon-Brown, M.A., M.D. (Cantab.), D.Sc. (Oxon.), F.R.C.P., and R. Hilton, M.A., M.D. (Cantab.), F.R.C.P. Seventh Edition. 1936. Baillière, Tindall and Cox, London. Pp. ix plus 308. Price, 10s. 6d.

WHEN we say that this very important book is outdated, we hope that we shall not be misunderstood. Before saying what we do mean we should perhaps say two things that we do *not* mean; we do not mean that the teaching is out of date in this seventh edition —on the contrary, the book has been completely revised, rearranged, and many chapters have been rewritten: nor do we mean that the mode of approach of the subject is old fashioned and that the book has outgrown its usefulness.

Modern scientific medicine with the help of physiology is advancing along two roads which both lead in the same direction: (*a*) we are continually applying physiological facts, newly discovered, in our practice, and making remarkable advances in diagnosis and treatment; on the other hand (*b*), we are continually sending empiricisms to the physiological laboratory for the rationale to be worked out and thereby finding out new physiological facts which will often lead to simplification or elaboration of the empiricism, in either case much to its advantage. As medicine is much older than physiology, empiricism was for a long time the order of the day and the advances first made were along the old road (*b*), but as time goes on the new road (*a*) must inevitably become the more important thoroughfare. To-day, the traffic is fairly evenly divided: thirty years ago when the first edition of Sir Walter's book was published, the new road was scarcely opened and even the old road was not so well used as it is to-day, now that—to maintain the metaphor—the country beyond has been opened up and popularized.

Sir Walter and his book played no small part in bringing about this closer association between physiology and the practice of medicine; the textbooks of medicine of to-day contain much more physiology and those of physiology much more medicine than was the case when the first edition of this book was published. Further, Sir Walter has had many imitators, some of

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their books are more comprehensive and many of them successful.

However, though its conception is no longer unique, the book still has many unique qualities, and no physician could fail to gain much in the way of practical knowledge from its perusal. We commend this book strongly to the notice of all practising physicians: for those who are familiar with the early editions, we will add that there is sufficient important new material in this edition to make it well worth re-reading.

L. E. N.

AN INTRODUCTION TO MEDICAL SCIENCE.—By W. Boyd, M.D., M.R.C.P. (Edin.), F.R.C.P. (Lond.), Dipl. Psych., F.R.S. (Canada). 1937. Henry Kimpton, London. Pp. 307. Illustrated with 108 engravings. Price, 16s.

ONE cannot fail to admire both the courage and the energy of the author in undertaking the writing of this book. It is far harder to write down to the level of comprehension of a medically-uneducated public, successfully, than to write on a highly technical subject that one has not completely mastered, and 'get away with it'. The 'popular' medical book is usually written by a professional writer, who, if he happens—which is unusual—to be a medical man, has probably been an unsuccessful one, and is therefore suspect. Here, however, the case is quite different; the writer is a most distinguished pathologist, so that when one encounters statements that appear to be inaccurate, one at least knows that they were not made through ignorance, but are often the inevitable result of necessary simplification of language.

Under the heading of 'undulant fever', the author writes 'This disease is caused by a very small organism midway in form between a coccus and bacillus. *For this reason it is called neither*, but is given the name of its discoverer, Sir David Bruce, and is known as Brucella'. Had the italicized portion (our italics) been omitted we feel that the kindergarten atmosphere would have been removed without any loss of clarity. There are many such examples.

The statement that it is necessary to give quinine for several months to eradicate the malarial parasites 'from the spleen' is misleading. The author missed a great opportunity for picturesque generalization in not giving the modern classification of the anæmias.

The book appeals to us far more as one for nurses, technicians, non-medical missionaries, and possibly doctors' wives (the book is dedicated to E. B.), than as one either to recommend or lend to patients (in the reviewer's experience average American patients already know far more than this book could teach them, and are no better, as patients, for their knowledge!) or for the pre-medical student, who would later have to do a certain amount of unlearning.

PHYSIOLOGY IN HEALTH AND DISEASE.—By C. J. Wiggers, M.D. Second Edition. 1937. Henry Kimpton, London. Pp. 1124. Illustrated with 191 engravings. Price, 42s.

THE success of the first edition of this book, which was exhausted so rapidly that it enabled a second edition to be issued after so short an interval as two years, is a sign of the times and indicates the existence of a much closer liaison between the physiologist and the physician than there has ever been hitherto. Though we have some excellent standard textbooks of physiology which will always be in demand, it is books of this type that should be the textbooks of the medical student in the future, and the time separation in the teaching of the physiology of health and of disease, respectively, should disappear; this at least presents one way of cutting down the curriculum.

In this new edition, no very extensive changes have been made, but there has been a certain amount of rearranging of matter, necessary additions, and a few corrections.

The writer has a clear and easy style which makes reading a pleasure, though now and then the sparing of commas makes it necessary to read a sentence more than once before its meaning its grasped.

Though sneering at the mistakes of our predecessors is out of place in any scientific book, now and then a little mild cynicism adds a piquancy to their perusal; for example, in discussing the classification of the anæmias the author writes 'The common classification of clinical anæmias into primary and secondary forms is only of historical interest and reminiscent of the day when it was believed that some anæmias are the result of (secondary to) causes which are or ought to be discoverable, while primary anæmias are due to some essential change in blood cell physiology which might defy the insight of man'.

The statement that the anti-pernicious-anæmia factor is produced in the pyloric mucosa was certainly justifiable when it was written, but may have to be revised in view of more recent work on this subject.

This new addition is, we foretell, likely to be as popular as the first: it certainly deserves to be.

BABY'S POINT OF VIEW: THE PSYCHOLOGY OF EARLY BABYHOOD.—By E. J. Partridge, F.R.C.S., L.R.C.P. 1937. Oxford University Press, London. Humphrey Milford. Pp. 94. Price, 2s. 6d. Obtainable from Oxford University Press, Bombay and Calcutta

THIS small book explains to the modern mother the findings of psychologists in regard to the emotional development of infancy. It stresses the psychological need for breast feeding and the psychological injury inflicted on infants by separation from their mothers. The feeling of safety and the feeling of being loved are the primary needs of the infant. The author stresses that these needs can only be fully met by the mother herself and that even the youngest infant recognizes and resents a substitute. The author condemns the too harsh discipline that is commonly imposed on infants in western countries and believes this discipline to be a frequent cause of neurotic illness in adult life.

Whether this be so or not, this small volume should prove a valuable corrective to those brought up in a too strictly disciplinarian school of thought. In this country the effects of lack of discipline are more commonly seen than those resulting from a too strict and harsh regime. Observation leads one to the conclusion that children must learn to accept a certain discipline if they are to develop satisfactorily. This discipline ought of course to be imposed in a way that will arouse as little resentment as possible in the child's mind. Mothers, however, need not always be blamed if feelings of resentment are aroused in their children, for some infants demand so much from their mothers that the complete fulfilment of their demands is impossible; even the gentlest treatment may arouse feelings of resentment in infants born with this diathesis. This point is not raised by the author who tends to lay an undue burden of responsibility on the mother who may in consequence blame herself unduly should her child develop a neurotic illness in later life.

J. B.

A MANUAL OF TUBERCULOSIS FOR NURSES AND PUBLIC HEALTH WORKERS.—By E. Ashworth Underwood, M.A., B.Sc., M.D., D.P.H. Second Edition. 1937. E. and S. Livingstone, Edinburgh. Pp. xix plus 404. Illustrated. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 6-6

WE welcome the publication of the second edition of Dr. Underwood's little book on tuberculosis, the scope of which has now been widened in order that it should appeal not only to the nurses, but also to the class of persons such as almoners, sanitary inspectors and other health workers. In view of the recent developments on the subject there have been considerable additions and alterations in this edition. Chest surgery has been dealt with in a separate chapter. The last three sections are entirely new; they have been added to assist those who have to deal with the administrative side of the subject.

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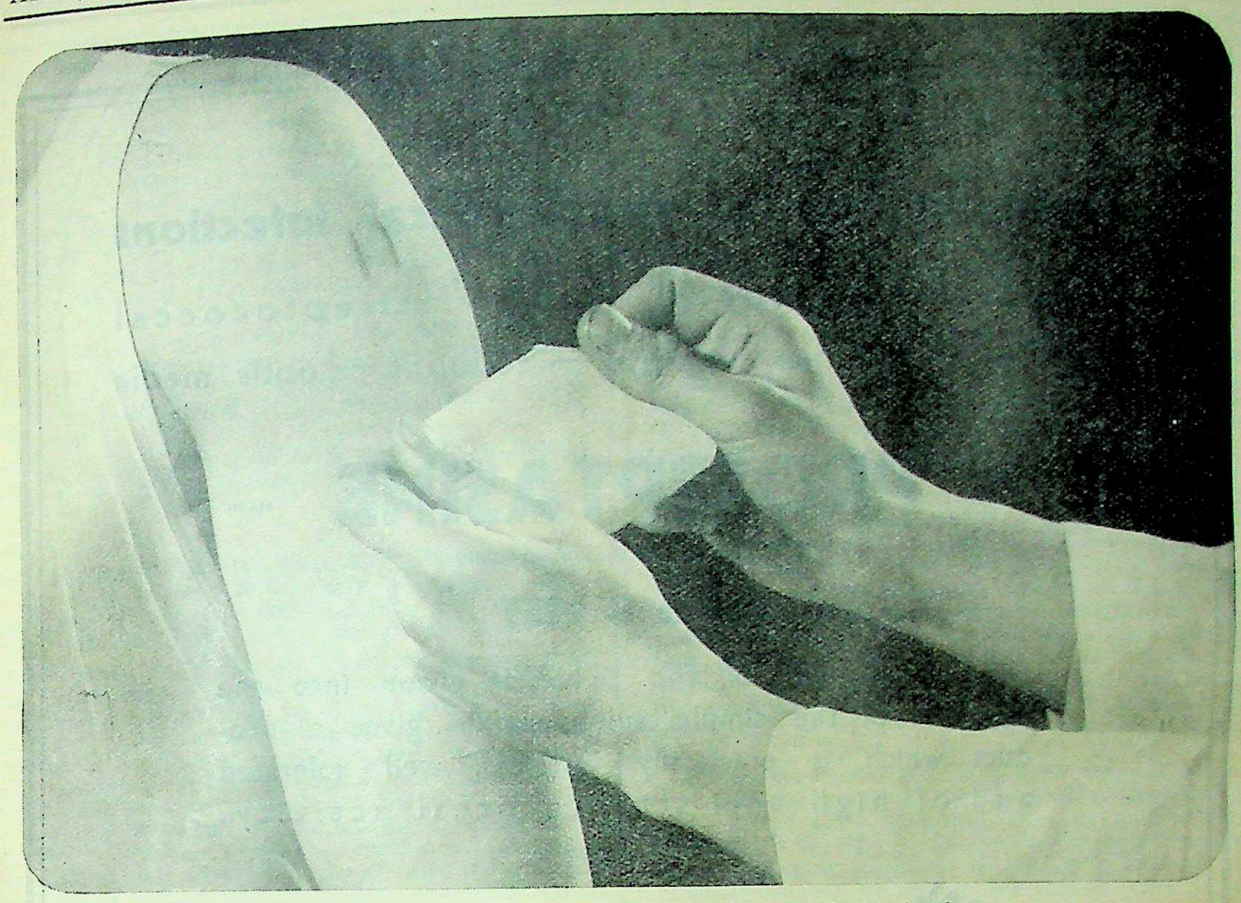

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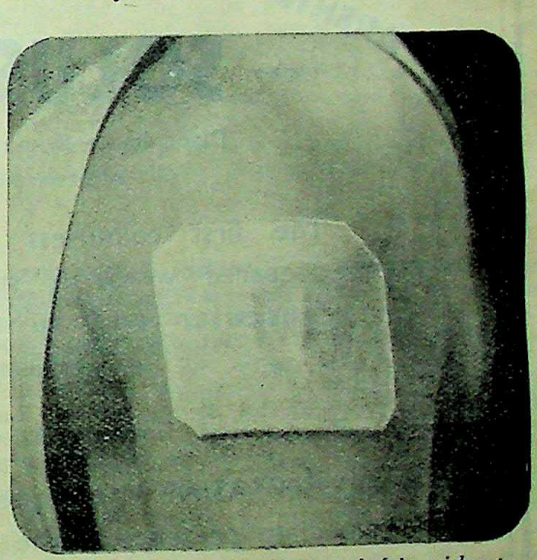

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The subject of tuberculosis has been dealt with in a very comprehensive manner. The summaries at the end of the chapters and the glossary at the end of the book are good and useful.

Some of the material included is really unnecessary, such as the operation of shaving the beard and that of hair-cutting of male patients; two full pages are too much for this purpose. Brevity, obviously necessary for a book of this type, has at times led to slight inaccuracies, such as are found in connection with the Mantoux test and the preparation of dilutions of tuberculin.

There are a large number of illustrations in the book, twenty-three being added in this edition. While many of them are very good, a few, such as the administration of oxygen by the funnel method, might be left out.

Altogether this is a good book and will be helpful to nurses and health visitors.

R. C.

THE RADIOLOGY OF PULMONARY TUBERCULOSIS. —By J. E. Bannen, M.B., Ch.B., D.M.R.E. 1937. Baillière, Tindall and Cox, London. Pp. viii plus 156, with 39 figures in the text. Price, 12s. 6d.

THIS handy and copiously illustrated book deals mainly with *x*-ray diagnosis of pulmonary tuberculosis. After giving some details on the technique of chest radiography, the author proceeds to describe the radiological appearance of the normal lung, noting some anatomical and physiological points bearing on the subject. Here we would have liked to see included at least one radiogram of the normal chest, although the book is obviously meant for radiologists. The next four chapters deal with *x*-ray appearances, pathogenesis of pulmonary tuberculosis from the radiologist's point of view, and differential diagnosis, but the descriptions suffer from absence of references to the illustrations. Chapter VII is devoted to the clinical aspects of the disease and briefly describes different methods of examination for diagnosis. The book ends with a chapter on collapse therapy. The illustrations are clear and varied.

R. C.

PRENATAL AND POSTNATAL MANAGEMENT.— By J. St. George Wilson, M.C., M.B., Ch.M., F.R.C.S., L.R.C.P., F.C.O.G. 1937. Edward Arnold and Company, London. Pp. viii plus 206. Illustrated. Price, 10s. 6d.

THIS short handbook provides a very practical introduction to the subject of prenatal and postnatal care. The information is very compressed and most of it is given in a rather dogmatic 'note' form rather than as a discussion of the subject.

The illustrations are many and most of them are good. But a diagram showing the vagina as a widely patent canal with a Dutch cap pessary in a position which is not generally accepted as the correct one is open to criticism.

The author makes some sweeping and pessimistic statements. He says that 'constipation is almost invariably associated with pregnancy' (page 3) and 'a time will come sooner or later when she will need aperients' (page 35). This can hardly be said to be in accordance with experience in this country and suggests that insufficient attention is given to prenatal advice regarding diet and the intake of fluid. He also says that 'There is a certain amount of generalized adenoma (erosion) of the cervix in every married woman' (page 102) which suggests the impression gained in a hospital out-patient department rather than of an antenatal clinic.

The book is however a welcome addition to a much neglected subject and contains a great deal of very useful information.

M. I. N.

A TEXTBOOK OF OPHTHALMIC OPERATIONS.—By H. Grimsdale, M.B., F.R.C.S., and E. Brewerton, F.R.C.S. Third Edition. 1937. Baillière, Tindall and Cox, London. Pp. ix plus 322. Illustrated with 105 text-figures. Price, 17s. 6d.

THIS is the third edition of this excellent book which alone is sufficient evidence of its usefulness and success. It consists of twelve chapters and an index. The first chapter is devoted to operations on the eye muscles, the second to operations for ptosis, the third and fourth to operations on the lids, the fifth to operations on the conjunctiva, the sixth is on enucleation and its substitutes, the seventh is devoted to operations on the lachrymal apparatus and bones of the orbit, the eighth is on cataract, the ninth on after treatment of cataract, the tenth on the operative treatment of glaucoma, the eleventh on some operations on the cornea, sclerotic and iris, and finally the twelfth is on foreign bodies in the eye.

In the present edition historical operations and those of interest in the development of operative surgery have been largely eliminated, but there are still many obsolete operations that could with advantage be left out, more especially those pertaining to the lids.

The chapters on glaucoma and cataract are especially good. Ophthalmic surgeons working in India would however hardly agree with the authors' remarks that more than half the operations of 'couching for cataract' would be considered successful, or that an operation for depression or reclination of a cataractous lens should be attempted by any one other than a quack.

Many eye surgeons would also differ with the authors that posterior sclerotomy is a scientific operation for the relief of acute glaucoma, even as a temporary measure. It should be classed as a desperate operation for a desperate condition of the eye. There is no anterior chamber, no matter how shallow, that cannot be entered with a fine knife.

On the whole the book is an excellent one, well provided with illustrations which very rightly are largely diagrammatic. It is written in simple and clear style and is eminently practical. At the end of each chapter is a list of authorities to which the reader can refer for more detail.

We recommend it as a most useful addition to the library of every medical man connected with eye work in India.

E. O'G. K.

PHARMACOPŒIA OF THE GOVERNMENT OPHTHALMIC HOSPITAL, MADRAS. Pp. 37. Price, As. 14 and ROUTINE METHODS OF TREATMENT IN THE GOVERNMENT OPHTHALMIC HOSPITAL, MADRAS. Pp. 33. Price, Re. 1. By Lieut.-Colonel R. E. Wright, C.I.E., M.D., D.P.H., I.M.S., and Rao Bahadur K. Koman Nayar, L.R.C.P. & S., D.O.M.S. 1937. Printed by the Superintendent, Government Press, Madras

THESE two excellent little books compile the routine methods of treatment in the famous Government Ophthalmic Hospital, Madras.

The pharmacopœia contains the various drops, injections, lotions, oils, ointments, pigments, powders, mixtures, etc. The booklet, *Routine Methods of Treatment*, contains, amongst the most important articles on anti-syphilitic treatment, the treatment of arterial spasm and ischæmia, the treatment of collapse under anæsthesia or narcosis, the various uses of electrolysis, the various pre-operative and post-operative hæmostatics, hypnotics and sedatives, the treatment of hookworm, malaria and leprosy, general narcosis and the treatment of respiratory failure, the non-operative methods of treatment of primary glaucoma, the prophylactic and curative serum treatment for diphtheria and tetanus, the treatment of sympathetic ophthalmia and trachoma, tattooing of the cornea, etc.

We have nothing but praise for these two publications which are simply written, explicit and practical. The authors are to be congratulated on giving the

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benefits of their experience in such a concise, practical way to medical men working in India.

Both booklets are cheap and we venture to say that no medical man who has to attend eye patients should be without them. We sincerely hope that they will be brought to the notice of the medical profession.

E. O'G. K.

DISEASES OF THE NOSE, THROAT AND EAR: A HANDBOOK FOR STUDENTS AND PRACTITIONERS. By I. Simson Hall, M.B., Ch.B., F.R.C.P.E., F.R.C.S.E. 1937. E. and S. Livingstone, Edinburgh. Pp. xv plus 423. Illustrated. Obtainable from Messrs. Butterworth and Company (India), Limited (Publishers), Calcutta. Price, Rs. 7

THIS is yet another book designed for the needs of the busy practitioner and the student. It is strictly limited to this aim.

No attempt has been made to describe in elaborate detail diseases of the ear, nose and throat which the student and practitioner for lack of training and experience might fail to recognize. For this reason there are many omissions, but this is more than balanced by a fuller discussion of commoner complaints. The best chapter in the book is the one on the larynx which finishes up with a description of 'endoscopy' in quite sufficient detail to let the practitioner know what can be achieved by this method. A warning is also given that in unskilled hands it may be so dangerous as to endanger life. In fact, it is a highly specialized branch and may be called a speciality within a speciality.

Tracheotomy is given the full description which it deserves and there is a paragraph on 'detubation' which is overlooked in so many books nowadays.

There is a very useful appendix which consists of instructions for the preparation of ear, nose and throat cases for operation, instructions as to how to use head radiant-heat baths and ends with a short list of useful prescriptions.

Altogether an admirable little book which fulfils the author's intentions.

H. E. C.

A MANUAL OF PRACTICAL TROPICAL SANITATION.—By J. Balfour Kirk, M.B., Ch.B., M.R.C.P., D.P.H., D.T.M. & H. 1937. Baillière, Tindall and Cox, London. Pp. ix plus 300, with 46 figures.

DR. BALFOUR KIRK'S is a welcome addition to the small group of elementary books on public health in tropical countries. The subject-matter of this book is much more extensive than the title would suggest. It is, in fact, a small treatise on general hygiene. There is hardly any branch of human knowledge which may not be applied for the benefit of personal and communal health, and it has been the endeavour of the modern public health worker to employ as much as possible of the vast knowledge which the phenomenal expansion of scientific research has placed at their disposal.

To select suitable material for use by non-medical practical sanitarians and present it in a simple, concise, and readily-assimilable form is no mean task. It may be at once said that in this Dr. Kirk has succeeded very well. However, much of the matter contained in the first two chapters could have been omitted from a book on practical sanitation.

Communicable diseases loom large in the programme of public health workers in the tropics. Nearly half of the book is devoted to this section and to disinfection, but even so, only a very sketchy description of each disease has been possible. The opening pages of chapter 3 give much useful information to a layman concerning epidemiology. A little more expansion of this portion to include some information on immunity and the explanation of such terms as 'incubation period' would be desirable.

In a small book like this it is naturally difficult to keep a proper balance in the treatment of the various subjects, and one does come across some portions which occupy more space than they deserve. The paragraph on standardization of disinfectants may be cited as an illustration. A note on balanced diet could have been added with advantage. The last chapter contains very useful data to facilitate calculations usually made by health workers. This small book will be found of great interest and utility by a large number of people interested in public health work in the tropics.

CHEMICAL PROCEDURES FOR CLINICAL LABORATORIES.—By M. R. Mattice, A.B., Sc.M. 1936. Henry Kimpton, London. Pp. 520. Illustrated with 90 engravings and 2 coloured plates. Price, 30s.

THE physician is daily becoming more dependent on chemical procedures for the correct diagnosis of their diseases and the treatment of his patients. There are many books on laboratory technique, but not so many that are devoted entirely to chemical procedures. The book under review is a very good example of a guide to the more practical and useful methods with which the 'compleat physician' should be familiar, so that, even if he has not time to carry out the examinations himself, he can do so with the help of an unqualified technician.

There are four parts, on the blood, urine, gastro-intestinal secretions, and miscellaneous biological fluids, respectively, and finally there is an appendix. Whilst as regards length the four parts are arranged in *diminuendo*, as regards their appeal to the reviewer they are arranged in *crescendo*, and in this is included the appendix. The chapter on gastric analyses is good and contains some useful type acid curves. The gruel test meal seems to be favoured, as it is in Great Britain but not usually in America. The table showing the types of curves found in different diseases is one that is copied from textbook to textbook, and it is surprising that one based on larger figures could not be found. Surely most laboratories could give data for gastric analyses on more than seven cases of gall-stones?

The appendix contains a number of useful sections, not the least being that on the statistical treatment of data. This contains formulæ with sufficient explanation to help those with even the rudiments of mathematical knowledge. We feel sure that the advanced statistician, the arch enemy of the practical laboratory worker, would not approve of this section: even the reviewer had some doubts about the simplified formula given for obtaining the 'probable error', nevertheless, it is a valuable addition to the book. We can recommend this work strongly to the physician, the student, and the laboratory worker.

CLINICAL LABORATORY DIAGNOSIS.—By S. A. Levinson, M.S., M.D., and R. P. MacFate, Ch.E., M.S. 1937. Henry Kimpton, London. Pp. 877. Illustrated with 144 engravings and 13 plates. Price, 45s.

THIS book was a very ambitious undertaking; the authors have attempted to provide in one volume the technique and rationale of all laboratory diagnostic procedures, cytological, histological, chemical, bacteriological, protozoological and helminthological, combined with enough anatomy, physiology and clinical medicine to make the subject intelligible to the student who has not learnt his clinical medicine and to the physician who has forgotten his physiology and anatomy. To say that the attempt had been an unqualified success would necessitate a combination of generosity and elasticity of conscience in a reviewer which should disqualify him for the work he had undertaken: on the other hand to call it a dismal failure would be not only a churlish and ungenerous return for the very hard work that the authors have put into the book, but frankly untrue. In other words the book has some outstanding qualities, but many faults. If the book goes into another edition, which we sincerely hope it will, we also hope that the authors will spend as much energy in correcting

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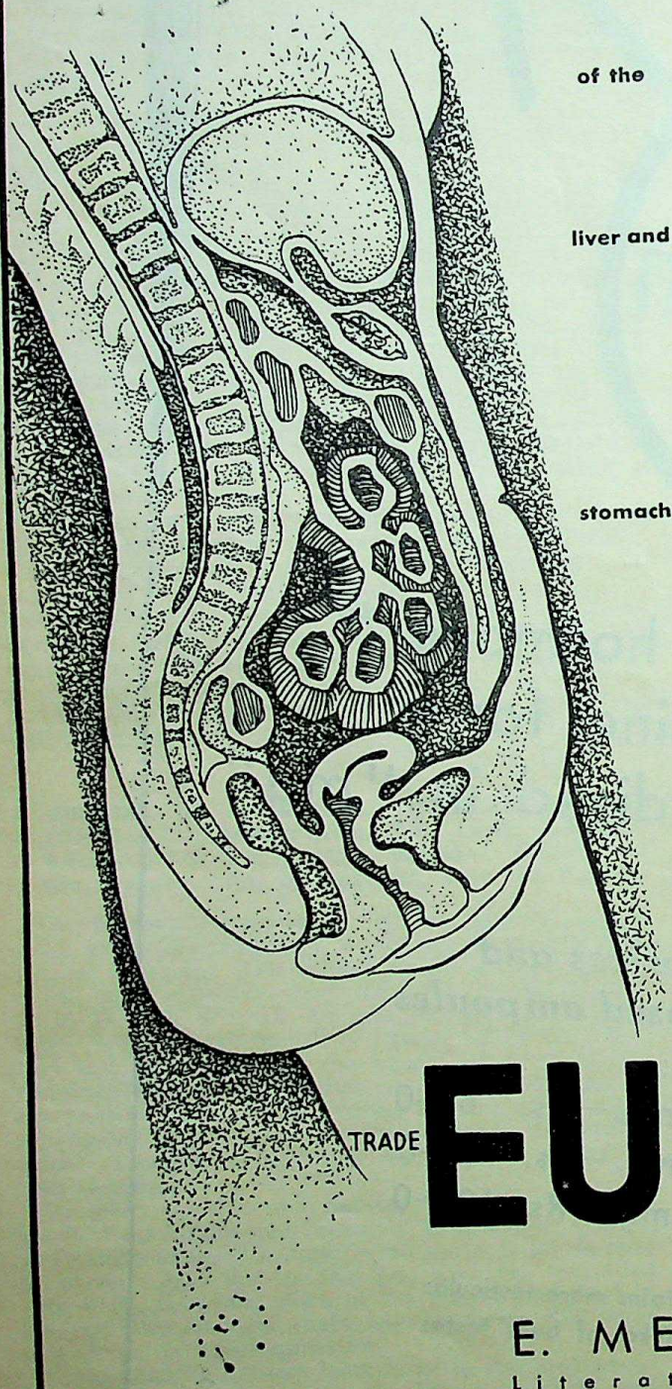

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its mistakes and purging it of its redundancies as they did over the original compilation.

Amongst the redundancies are some long quite useless lists and tables; for example, we cannot really see what useful purpose the list of 'Common infectious diseases and the causative organism' serves. One reads, '*Amebiasis.* Infections caused by amœbæ'. '*Ankylostomiasis.* Infection with Ankylostoma duodenale'. One's interest gradually works up, after a slight set-back in finding asthma included as an infectious disease, until it reaches almost white heat when one finds that filariasis is caused by *Filaria bancrofti* and Leishmaniasis by (no, you are wrong, there is a catch here) *Herpetomonas donovani.* We feel they have rather cheated over '*Rabies* caused by a specific filterable virus', and they have certainly slipped up over '*Rat-bite Fever.* Leptospira icterohæmorrhagiæ'.

They claim to describe the technique of spleen puncture, which they say is a useful method of distinguishing Gaucher's from Niemann-Pick's disease, but had they said 'You just puncture—the spleen' they would have gained half a page and the reader would have lost nothing. The only point they emphasize is that, as the syringe is withdrawn, suction should be maintained, which is the exact reverse of the reviewer's experience.

On the credit side, there is an immense amount of information that is available in no other book and, as much of this is taken from unpublished records, it is probably available nowhere else. This includes hæmatological data for children of various ages from birth to puberty. There is even a graph showing the differences in the normal sternum puncture findings in children of different ages; from 1 to 3 years the myeloid/erythroblast ratio is 2 to 1, whereas at 10 years it is 3½ to 1 which is about the adult proportion.

The section on gastric analysis has been done very thoroughly, many different types of acid curve are given, and the difference between the normal curves after the gruel meal and the alcohol meal, respectively, is brought out very clearly, again in a way that will be found in no other book that we know.

We will conclude by saying that the book is a unique source of information on many subjects and will be a very valuable addition to any medical library. A well-equipped clinical laboratory can scarcely afford to be without a copy.

L. E. N.

CLINICAL CHEMISTRY IN PRACTICAL MEDICINE.—C. P. Stewart, M.Sc. (Dunelm), Ph.D. (Edin.), and D. M. Dunlop, B.A. (Oxon.), M.D., F.R.C.P.E. Second Edition. 1937. E. and S. Livingstone, Edinburgh. Pp. ix plus 372. Illustrated. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 7

THE book has been written from the point of view of imparting the broad general knowledge of biochemistry to the general practitioner as is essential to his every-day practice. It cannot be considered either as a standard textbook or as one suitable for laboratory workers. The main utility of the book lies in the fact that it deals with such simple, useful and at the same time reliable methods of laboratory analysis as are essential to the busy practitioner in making a quick diagnosis in order to find out a correct line of treatment for his patient.

The importance of a broad general knowledge as to how the various biochemical analyses are carried out and a more detailed knowledge of the actual methods of carrying them out (for example, important clinical tests of blood, urine, sputum, etc., which do not require much time and equipment and which can easily be performed in the practitioner's own surgery) are essential to every practitioner of medicine, surgery and gynæcology. This book will be a great help to keep him up to date and would be of great value in making a quick diagnosis in cases of emergency instead of having to wait until the report comes from the laboratory.

The book has been well written and the author has been successful not only in describing, within a small compass, the biochemical investigations of the more important every-day problems but also in explaining the rational foundation on which such tests rest, the idea being that such explanation is of help in understanding the mechanism of many of the pathological processes concerned.

J. P. B.

AN INTRODUCTION TO BACTERIOLOGICAL CHEMISTRY.—By C. G. Anderson, Ph.D. (Birm.), D.Bact. (Lond.). 1938. E. and S. Livingstone, Edinburgh. Pp. viii plus 278. Illustrated. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 7

THIS handy volume is divided into three parts. The first part deals with general considerations, such as hydrogen-ion concentration and pH, oxidation-reduction potentials, colloids and adsorption, enzymes, and the chemical composition of bacteria, yeasts and lower fungi. The second part deals with metabolism and discusses the nutrition of bacteria, the adaptive and constitutive enzymes, growth factors, bacterial respiration, nitrogen and carbohydrate metabolism, alcoholic fermentation, the fermentation products of lower fungi, industrial fermentations for the production of alcohol, glycerol, acetone, lactic acid, power-gas, citric acid, etc., and finally the proteins, polysaccharides, lipoids and pigments of micro-organisms. The third part discusses some aspects of immunochemistry such as antigens, haptens, antibodies and complements and the mechanism of antigen-antibody reaction. An appendix at the end gives a concise description of the methods used in isolating and identifying the different chemical products of bacterial metabolism. There are also references to original literature at the the end of each chapter to help the reader to study details.

Our knowledge of the chemistry of bacterial metabolism has grown very rapidly during the last 10 or 15 years and there seems to be no single book giving a survey of the recent progress of the whole field of bacteriological chemistry in a convenient form. The author has discussed this highly-technical subject in a very clear and readable form and the volume will be welcome not only to students going up for honours, diplomas or degrees in bacteriology but also to the wider circle of bacteriologists, medical men and people interested in the recent advances in biochemistry.

S. G.

MANUAL OF CLINICAL AND LABORATORY TECHNIC.—By H. B. Weiss, A.B., M.D., F.A.C.P., and R. Isaacs, A.M., M.D., F.A.C.P. Fifth Edition. W. B. Saunders Company, Philadelphia and London. Pp. 141. Price, 6s. 6d.

THERE are a large number of books dealing with laboratory technique, but there are very few of such a small size and yet covering so much ground as the present volume.

The descriptions given in most of the sections, though short and concise, contain almost all the necessary information about the ordinary routine laboratory work, but the chapters on history-taking, physical examinations and the laboratory report form, in the beginning of the book, and the last chapter, on the nutritional value of food, are far too elaborate and not of much use; the space saved might have been utilized to extend the section on blood examination which is too abbreviated and could be improved upon.

The claim made by the authors that it provides an available source of some of the newer tests is justified. On the whole, the manual provides, as observed by the authors, 'a ready reference to the gross details of the most common laboratory tests'. It should be useful to the laboratory workers on account of its small size and cost, and for the very useful information that it contains.

C. R. D. G.

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AN INTRODUCTION TO PHYSICAL ANTHROPOLOGY.—By E. P. Stibbe, F.R.C.S. Second Edition. 1938. Edward Arnold and Company, London. Pp. vii plus 230. Illustrated. Price, 10s. 6d. Obtainable from Messrs. Longmans Green and Company, New York

THIS is the second edition of the little book which well deserves its title. A new feature of this edition will be seen at the end in the appendix in the statistical data by Dr. W. A. Smart. If this, as has been remarked in the preface, is intended to guide 'the man actually working in the field' we have our doubts about the advisability of its inclusion in a work chiefly designed as an introductory lesson for the amateur and the student, who are less likely to relish the underlying mathematics.

The main subject-matter of this book has, however, been presented in good sequence and the author has succeeded while carrying his readers, step by step, through the different phases of his study in creating a deep interest in the subject.

If the criterion of successful book writing be the ease with which the reader is able to grasp the subject when he closes the book, it is abundantly manifest that Mr. Stibbe has been remarkably successful. The writing is clear, comprehensive and uniformly interesting, and is conspicuous by the absence of any confusing details to embarrass a beginner.

We should have been happier, however, to find the technical names used in chapter XII, explained either in the previous section XI, or mentioned in the glossary at the end. A beginner, who has learnt of the classification of the skull according to the length-breadth index or height index, as mentioned in the chapter (XI), is likely to wonder when confronted with other terms used in the subsequent section XII, *e.g.*, mesaticephalic, akro-cephalic, tapeino-cephalic, etc., which are nowhere mentioned or explained.

Though the book is intended for students of anthropology we feel sure that students of human anatomy will profit by it as well.

In the matter of printing, a more careful proof-reading would have eliminated such minor faults as will be seen on page 18, para. (*c*), namely, 'wit' for 'with'. The illustrations are uniformly good and neat, the get-up of the book attractive, and on the whole the publisher's task is satisfactory.

THE DISSECTION AND STUDY OF THE SHEEP'S BRAIN AS AN INTRODUCTION TO THE STUDY OF THE HUMAN BRAIN.—By John Wilkie, B.Sc. 1937. Oxford University Press, London. Humphrey Milford. Pp. xv plus 95. Illustrated. Price, 6s. Obtainable from Oxford University Press, Bombay and Calcutta

THIS is a short treatise on the sheep's brain, and is intended to be complementary to the dissection of a human brain; and where such materials may not be sufficiently available also to supplement it.

Indeed, the human brain offers a very complicated structure for study; especially so are those parts that have undergone remarkable evolutionary transformations, *e.g.*, the rhinencephalon and flocculus, paraflocculus, etc., in the cerebellum; but these however are well developed and easily discernible in the brain of a lower animal.

A preliminary study of the brain of a macrosmatic mammal cannot but help to minimize the difficulties met with in the dissection of a complex human brain; besides, it enables the student to grasp the fundamental changes involved and compare those with the corresponding human parts.

Mr. Wilkie's book is therefore very welcome and is sure to fill a very distinct need.

The plan of the book is commendable from the practical point of view. After the first dissection is over the student has made a general survey of the brain as a whole and is led to the details of the deeper structures in the second dissection. The hand sections made at the different levels offer material for a profitable study and application of the knowledge gained in the previous dissections.

We have little doubt that Mr. Wilkie's work will help the student of human anatomy to set his knowledge on a background of comparative anatomy, as it will help the general students of zoology to grasp the nature of evolutionary changes undergone in the human brain.

We recommend the book to every student as a guide during his dissection of the 'brain'.

S. C. S.

PRACTICAL NEURO-ANATOMY: A TEXTBOOK AND GUIDE FOR THE STUDY OF THE FORM AND STRUCTURE OF THE NERVOUS SYSTEM.—By J. H. Globus, B.S., M.D. 1937. Baillière, Tindall and Cox, London. Pp. xxii plus 387, with 92 figures in the text and 55 plates. Price, 27s.

THE most difficult branch of anatomy is undoubtedly the anatomy of the nervous system. A book in which the practical side of this subject is clearly and accurately portrayed is naturally very desirable in view of the great advances that have been made within recent years in the surgery of the nervous system.

An introduction of nine pages contains a brief description of the embryology of the brain and spinal cord. As the development of the nervous system is an important approach to the study of brain tumours and therefore has a great practical bearing, this section is too brief. If the book was purely practical one would not make this comment, but it is full of detailed description.

Directions are given for the dissection of the brain, cerebellum and the spinal cord. The text is most lucid and comprehensive and the illustrations both in the embryological and the general section are excellent. There are 256 pages of close reading.

A description is given at the end of the anatomical section of methods used in the preparation of nervous tissue for the study of its microscopic structure.

This section is followed by plates which are perforated in such a way that they may be detached. On these are inserted semi-completed drawings so that the student may add the desired detail and build up the component parts of the nervous system from the diagrams in the main part of the book. Directions are given to replace these diagrams by means of gummed paper after completion.

The book contains anatomical, histological and physiological details which cannot possibly be studied in any practical sense. The title of the book is therefore rather a misnomer. The book is both practical and theoretical but too descriptive for any practical textbook. It is impossible to identify tracts by any study of the gross anatomy of the brain. It would be preferable if the book were divided into two sections, one theoretical and the other practical.

It can be regarded as a textbook on the anatomy of the nervous system and as such is one of the best available. Such textbooks are, as a rule, very brief and there are but few in the English language.

T. H. T.

THE DEVELOPMENT OF THE VERTEBRATE SKULL.—By G. R. deBeer, M.A., D.Sc., F.L.S., F.Z.S. 1937. Clarendon Press, Oxford. Pp. xxiii plus 552. Illustrated with 143 plates. Obtainable from Oxford University Press, Bombay and Calcutta. Price, 30s.

THE skull has been studied by all those interested in comparative anatomy, anthropology and palæontology; much, therefore, is known already. Prof. deBeer's special studies, carried out over a period of 15 years, and done systematically and with a definite object in view, have brought forward many interesting conclusions, and have moreover revealed what still remains to be explained, and to what extent and in what directions such works should be continued.

The book is an embodiment, not merely of facts gathered from systematic studies on the construction of the vertebrate skull, but also of data obtained from experiments on its morphogenesis. The book is not intended to be a textbook, but is designed to serve a special purpose, that of a reference book for special

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studies on the skull and also for information regarding its phylogenetic history and morphology.

To encompass the overwhelming mass available on the subject is a stupendous task in itself, but to compile this material on a uniform morphological basis, using uniform nomenclature throughout, to enable a conducive comparative study, and that with precision, clearness and devoid of any redundancy, becomes a task of a very high standard indeed. This we feel has been done in a masterly way by Prof. deBeer.

The scheme of the work is well planned, and consists of four sections: The introductory section dealing with the historical aspects, and the nature of tissues forming the subject matter of the study; (2) the systematic section, dealing with the various groups of vertebrates with a detailed description of a type of each group. The other two sections, (3) comparative and (4) general, provide information regarding the morphological units of the different groups for comparison and to trace the phylogenetic history.

In subsections 38 and 39 is given the experimental evidence of the development of cranial cartilages and bones, and, in the appendix at the end, the various points on which further work is required have been given. A very complete, comprehensive and well-arranged bibliography has been incorporated.

The plates are explanatory to the context and are uniformly satisfactory.

In writing the book, the author was aware of the danger of overgrowth and we are confident that the arrangement of dealing with each subject in a comprehensive section, making reference to other sections unnecessary, was the best solution.

While, therefore, the book is scarcely intended to be read from cover to cover, we, nevertheless, hope that it will have a wide application in providing interesting and profitable reading for those interested in comparative anatomy and anthropology, and also for general students of biology and research workers—each class having his subjects in appropriate section or sections.

The publishers deserve sincere congratulations upon their excellent achievements.

S. C. S.

MEDICO-LEGAL ASPECTS OF THE RUXTON CASE.—By John Glaister, M.D., D.Sc., Barrister-at-Law, and J. C. Brash, M.A., M.D., F.R.C.S. Ed. 1937. E. and S. Livingstone, Edinburgh. Pp. xvi plus 284, with 172 illustrations. Price, Rs. 14. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta

ON the evening of 14th September, 1935, in Lancaster, Dr. Buck Ruxton murdered his wife and housemaid. He disposed of their bodies piecemeal in various ways. A large proportion of the two bodies was found in small pieces, in a ravine in Scotland some hundred miles away. A few other pieces were found in the vicinity. These pieces were collected, preserved and photographed. Although most of the identification marks were cleverly removed from these bodies, their identity was proved beyond any doubt. The proof that these pieces were in fact the remains of Mrs. Ruxton and the housemaid was an important link in the chain of evidence on which Dr. Ruxton was eventually convicted and hanged.

The book under review gives the whole story of how these remains were pieced together. It is the record of a clever piece of combined anatomical, anthropological, and medico-legal work, of which the authors are apparently, and from a scientific point of view very justifiably, proud.

The very existence of this book is a terrible indictment of the present extremely complicated state of the structure of human society. Medical science has become so intricate that the expenditure of hundreds of pounds and much of the valuable time of a number of scientific workers are sometimes necessary to prolong a life, but this is nothing compared with the amount of scientific labour and the thousands of pounds that must have been expended to cut short the life of the prisoner in this case. One cannot help wondering whether swift justice with its occasional miscarriages was not perhaps better in the long run, as miscarriages still occur.

The book is extremely interesting reading from many points of view; we can strongly recommend it for its scientific value, for anyone who enjoys 'thrillers', and finally for intending murderers who will either be able to profit by Dr. Ruxton's mistakes, or, better still, take warning from his failure to destroy all traces of the identity of the victims, and, we hope, reconsider their decision to resort to violent crime.

The publishers have done their work excellently and have produced a book that is worthy of a much pleasanter subject.

L. E. N.

LEHRBUCH DER BIOLOGISCHEN HEILMITTEL.—By Dr. Med Gerhard Madaus. Abteilung 1: Heilpflanzen. Volumes I, II and III. 1938. George Thieme, Verlag, Leipzig. Vol. I:—Pp. xxiv plus 902. Illustrated. Volume II:—Pp. from 903 to 1884. Illustrated. Volume III:—Pp. from 1885 to 2864. Illustrated. Index volume pp. 144. Price, R. M. 95

THE first volume discusses the genesis and foundation of biological therapeutics, homœopathy in biological therapeutics, healing with herbs, relation between plant and soil, cultivation of plants, important constituents of plants such as vitamins, hormones, enzymes, alkaloids, glucosides, saponins, colouring matters, tannins, essential oils, resins, fats, proteins, amino acids, etc. The special section dealing with individual plants has also been begun in this volume. Under each plant is given the name, source, distribution as shown on a map, a good photograph of the plant either coloured or otherwise, a short botanical description, a general and historical description, the medicinal action, use in practice, parts used, ordinary and homœopathic doses, and finally some recipes. The references to the literature from which the information has been collected are given in small print at the end under each plant. Eighty-nine plants have thus been discussed in vol. I, 174 plants in vol. II, and 190 plants in vol. III. The General Register gives an index of the Latin names of the plants or drugs, an index of the German names of plants, an index of the chemical constituents, and finally an index of the therapeutic uses.

The author has to be congratulated for the collection of such a large mass of useful knowledge in these volumes, which will prove helpful not only to botanists, agriculturists and medical men, but also to other workers who desire to develop the resources of the medicinal plants in their own country.

S. G.

ESSENTIALS OF MEDICINE: A TEXTBOOK OF MEDICINE FOR STUDENTS BEGINNING A MEDICAL COURSE, FOR NURSES, AND FOR ALL OTHERS INTERESTED IN THE CARE OF THE SICK.—By C. P. Emerson, M.D., and N. G. Brown, R.N. Twelfth Edition. 1936. J. B. Lippincott Company, Philadelphia and London. Pp. xxi plus 608. Illustrated. Price, 12s. 6d. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 9-6-0

THIS small handbook should prove useful to probationers and nurses, to help them to take an intelligent interest in their work.

THE BUSINESS SIDE OF MEDICAL PRACTICE.—By T. Wiprud. 1937. W. B. Saunders Company, Philadelphia and London. Pp. 177. Illustrated. Price, 12s.

THIS is a useful guide to the practitioner. It contains many valuable suggestions that will apply equally to practice in this country, but is, of course, written mainly for the practitioner in the United States of America.

OTHER BOOKS RECEIVED

State Insurance and Panel Practice for India. By Dr. C. P. Chaube. The Hindustan Times Press, New Delhi. Pp. 228. Price Rs. 2.

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Abstracts from Reports

ABSTRACT OF THE ANNUAL REPORT FOR 1935 OF THE PUBLIC HEALTH COMMISSIONER WITH THE GOVERNMENT OF INDIA

(*Continued from last issue, p.* 189)

FEVERS

Mortality under the general heading of 'Fevers' diminished as compared with the previous year by 202,326. This is described as a small decrease and is not greater than might occur by chance. An interesting fact is that 73 per cent of all the deaths from fevers were recorded in the northern areas stretching from Bengal to the North-West Frontier Province.

MALARIA AND QUININE

About 44 per cent of the total fever deaths are said to be due to malaria. The accuracy of these figures is discussed, and the view given is that the recorded total is exaggerated and that the actual truth lies somewhere round one and a quarter million deaths. Even at this lower level the figure can only be described as appalling. Malaria, causing as it does immeasurable misery and acting as a powerful deterrent to economic progress, constitutes one of the most formidable problems with which the Governments in India are faced.

Of the anti-malaria measures carried out in the different provinces, measures for the prevention and destruction of mosquitoes were practically all of a temporary nature. In these circumstances quinine had to be relied on largely for the amelioration of outbreaks. It is not suggested that quinine will eradicate malaria, but it certainly reduces the deaths, lessens the duration of the illness and prevents a considerable proportion of relapses. The annual consumption of quinine in India is stated to be only about 200,000 pounds. With what seems sound reasoning, the report states that India's annual requirements, if every sufferer were treated efficiently, should be in the neighbourhood of 1,250,000 pounds. These two figures are enough to indicate the vast shortage of this valuable drug.

Efforts at increasing the popularity of quinine are stated to have been made by the Central and Provincial Governments at different times, but at no time have these attempts been particularly successful. The greatest difficulty has been to place the drug at the disposal of the villager at a price which he can afford to pay. Propaganda to popularize the use of the drug must largely fail if the advertised drug remains, as it is now, beyond the average villager's financial resources.

ENTERIC FEVER

It seems clear that the recorded statistics of enteric fever are a gross underestimate of its prevalence. As the diagnosis of the disease is often dependent on accurate bacteriological examination, many enteric infections are probably missed. During the year under review a severe epidemic in Delhi city caused no less than 588 deaths, and until the existing insanitary conditions in that city are abolished, it is likely that similar figures will continue to be returned.

TUBERCULOSIS

Some of the most interesting pages of the report are devoted to the important subject of tuberculosis. The disease, particularly in its pulmonary form, has markedly increased during the last three decades, especially in the large urban and industrial areas. Only within recent years, however, has the infection begun to spread to villages, this extension of infection being partly due to the return of infected industrial workers to their homes and partly to the great development of road transport.

Regarding the vulnerability of India's rural population to tuberculosis, the report contains the following important statement:—

'Once infection is introduced into the rural villages, it is almost certain to spread rapidly and to cause a heavy morbidity and mortality. This fact has recently been illustrated in striking degree. The Gurkhas who come from the remote state of Nepal show, in comparison with other men of the Indian army, a much higher susceptibility to and mortality from tuberculosis. These gallant little soldiers, in other words, are from the tuberculization point of view members of a primitive race and being completely non-immunized are unable to resist an infection which often proves rapidly fatal. This is to a large extent the position of the great mass of the rural populations of India at the present time and as there are ominous signs that infection is spreading to and through these rural areas, the time has come when preventive campaigns should be extended to include these areas'.

Little accurate information is at present available regarding the extent of the disease. Investigations have shown that in 50 per cent of the cases there is a history of contact with another case in the family. Although India has not yet planned a national campaign against tuberculosis, there is in existence a number of tuberculosis associations in various parts of the country. The funds of these associations are limited, and in order to meet the situation much larger financial resources are essential and a large number of specially trained medical officers, nurses and home visitors are required. The object should be to have at least one special tuberculosis clinic in every municipality and rural town where skilled treatment and advice would be available to all. Once these clinics are established, it will be possible to arrive at a more accurate estimate of the incidence of the disease and of the needs of the sufferers. The work of the clinics will also indicate the extent to which hospital and sanatoria beds are required. It will never perhaps be possible to provide a sufficient number of beds to accommodate the hundreds of thousands of tuberculosis patients in the country, but this should not deter those interested in the prevention of the disease, because other methods can be successfully practised. The report while not denying that additional hospitals and other beds are necessary, points out that these are by no means the first requirements of an anti-tuberculosis campaign.

LEPROSY

Leprosy is most commonly met with in certain parts of Southern and Eastern India, where as many as 2 to 3 per cent of the population may be infected and where the incidence in groups of villages may be 5 to 7 per cent or even higher. In certain of the Himalayan valleys leprosy is also very common: in Central India, its incidence is lower and in the North-West lower still. The suggestion has been made that these variations may have some association with dietary conditions, since the virile races of the North-West, who ordinarily use a well-balanced diet, show less leprosy than the less virile races of the South and East whose diet is relatively poor. But other factors cannot be left out of consideration. For instance, it has been noted that a dry climate, hot in summer and cold in winter, is associated in India with a low leprosy incidence. Such areas, however, coincide to a greater or less extent with those inhabited by the more virile and well-nourished races. The disease is, again, frequently associated with bad social and hygienic conditions and poverty, although these conditions are not always present. Our knowledge of the epidemiology of leprosy is therefore incomplete and further investigations are necessary.

Many of the cases seen are of a relatively mild neural or neuro-macular type in which the disease does not progress to the more severe forms. These mild types are regarded by most workers as non-infectious. Of the estimated total of one million cases of leprosy in India, probably about 350,000 are a public danger. Isolation of infectious cases is known to be a most useful preventive measure, but the lack of a public opinion, quite apart from limited financial resources, makes it impossible to legislate for compulsory isolation. The existing Lepers Act provides for the compulsory removal of indigent lepers to institutions and it contains provisions for the prevention of lepers following certain occupations; yet, for different reasons, most of the provisions of this Act have been found difficult to apply.

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The only agency working on an all-India basis is the Indian Council of the British Empire Leprosy Relief Association which now has branches in most provinces. The Council maintains a leprosy research department, a training centre in Calcutta and a propaganda officer who tours all over India. Propaganda material is prepared in different languages and a quarterly journal in English is also published. Grants are made by the association to the provincial branches for leprosy work carried out in collaboration with or in addition to that done by provincial governments and local authorities. In addition to the activities of the provincial branches of the association, some provincial governments have their own anti-leprosy organizations which form a part of the activities of their public health departments.

Leprosy surveys were carried out during 1935 in Bengal, the Central Provinces, Madras Presidency, the Punjab and the United Provinces. These indicated in general that the incidence of leprosy is higher than had been previously realized.

During the last ten years several hundred leprosy clinics have been established for diagnosis and treatment. It is usually impossible and often unnecessary to maintain a special staff for these clinics, and they are held in most cases in existing hospitals and dispensaries once or twice a week, at hours when other out-patients are not present. It seems reasonable that the treatment of leprosy should form part of the ordinary treatment of a hospital, provided steps are taken to exclude the spread of infection.

The leprosy asylums now in existence in India have accommodation for only about 10,000 cases. A few of these institutions are organized and staffed by Governments and local authorities, but most are maintained by Christian Missions with the aid of government grants. In recent years, efforts have been made towards the establishment of leper colonies where housing and food are assured to the leper, where conditions of life approximate to those of an ordinary village and where those who are able to work are employed in raising stocks of food for their own consumption, while regular treatment can be provided for the cure or early arrest of the disease. Concerning these colonies, the following remarks from one Provincial Director of Public Health are of interest:—

'A colony is much cheaper to establish and to maintain than an asylum. It has an advantage over clinics in that in the colony the treatment can be taken to the segregated lepers, instead of expecting the individual lepers to go for treatment to the nearest hospital clinic which is frequently some miles distant. Were sufficient colonies started throughout the province, they would exercise a marked effect in checking the spread of leprosy among the general population, and in addition they would exercise a marked effect on the control of pauper lepers. The class of leper who now leaves his village to go and beg in the towns would have a colony to go to, where his housing and food would be assured, where the conditions of life would approximate to those of his village and where he would get regular treatment leading to cure or early arrest of his condition. He would be spared the experience of being regarded as an outcast and having to descend to the level of a pauper'.

Special short post-graduate courses of instruction are of great value, and the Indian Council of the British Empire Leprosy Relief Association organizes a short annual course in diagnosis and treatment intended for doctors who are to be in charge of leprosy clinics. The instruction is given in the School of Tropical Medicine, Calcutta. In 1935, seventeen doctors from various parts of India attended this course and the total number trained up to date is 765. For doctors engaged in full-time anti-leprosy work longer periods of instruction are arranged.

Apparently, leprosy workers are becoming increasingly convinced of the importance of preventing infection amongst children. Epidemiological studies have shown that children and young people are much more susceptible than adults, and it is generally believed that serious infections are most frequently contracted in childhood. Infections contracted in later life are said to produce milder and often non-infectious forms of the disease.

The question of itinerant lepers is discussed in the report and figures are given of investigations made in Bengal regarding this class of patient. It has been found that only about 30 per cent of itinerant lepers are infective, and that the rest are burnt-out cases. It would appear, therefore, that although control of the itinerant leper is desirable he constitutes rather an offence to æsthetics than serious danger to public health. The itinerant leper question would seem to form only a small part of the general problem of leprosy control.

CEREBRO-SPINAL FEVER

This disease would appear to be more prevalent than has been believed to be the case in the past. In Delhi city, there were 548 cases resulting in 216 deaths, which gives a case mortality of nearly 50 per cent. The figures given regarding cases admitted to the Campbell Medical Hospital in Calcutta show a case mortality of 61 per cent. The disease seems to have been most prevalent in the months of February and March whilst the highest incidence occurred among those between the ages of 15 and 44. The disease is undoubtedly associated with over-crowding.

MATERNITY AND CHILD WELFARE

While the figures recorded generally for maternal deaths are still far from accurate local investigations have revealed what must be regarded as a serious state of affairs. The report refers to the investigations in Assam carried out by Dr. Balfour, who found maternal death rates among the tea garden populations varying between 40 and 130 per thousand births. Enquiries in Madras Presidency in a number of municipal areas showed the rates to be three, four and sometimes five times as high as the English maternal mortality rate which has been the cause of great concern to the health authorities of England.

General information is lacking regarding the relative importance of the different pathological conditions giving rise to these maternal deaths, but some idea of the subject can be gathered from the records of certain women's hospitals which were summarized in the 'Journal of the Association of Medical Women in India' for August 1936. In that paper, 638 maternal deaths were analyzed and it was shown that sepsis (following delivery or abortion) accounted for 37.68 per cent of these. Next in order of frequency comes anæmia of pregnancy, accounting for 17.64 per cent. The large proportion of deaths due to sepsis is accounted for by the fact that many of the cases had been examined or mishandled and were infected before admission to hospital.

The following extract from the report gives a vivid idea of the magnitude of the problem facing the maternity and child welfare movement in India:—

'A total of 2,848,099 or 43 per cent of the deaths registered during 1935 occurred among children under the age of five years. Maternal deaths arising out of pregnancy are estimated to account for a further 150,000 to 180,000 deaths annually. Accurate figures, as already has been stated, are not available, but the maternal mortality rates for the larger towns indicate that large numbers of women die during the child-bearing age-periods. Along with this wastage of life a very serious wastage of health takes place. The percentage of women disabled as a result of pregnancy and labour may perhaps be taken as not less than 30 per cent and in a country where nearly ten million births are registered annually the percentage of women temporarily or permanently handicapped must be very large. To the physical disabilities from which both mothers and children suffer must be added loss of happiness and the less tangible, though not less important, damage to stability of temperament which follows in the wake of neglect of provision for the education and care of the mother and her family. General environmental measures undoubtedly effect a reduction in the incidence of disease and mortality, but the extent to which environmental hygiene alone can control disease is limited in certain respects. Without doubt education in the use of the services provided must accompany

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the establishment of these services if the maximum benefit is to be derived. Similarly the best midwifery schemes will be ineffective unless accompanied by widespread improvement in the general health'.

An important factor in an efficient maternity service is ante-natal care of the mother. Much requires to be done in India in this connection. It is stated that many of the hospitals attached to medical colleges and medical schools and training institutions for midwives have inadequate arrangements, and the students leave college with a minimum knowledge of the scope and value of ante-natal work. This work should, of course, be an activity in every infant welfare centre, but progress is made difficult because few realize the importance of preventive work in this field.

In every province in India the number of maternity beds requires to be largely augmented. In the province of Bombay, which has supplied fairly complete returns, the beds work out at one to 1,102 confinements instead of one for every 100 confinements which is stated to be a resonable, although not ideal, proportion.

Reference is made to the springing up of small maternity homes in many centres often as a result of voluntary enterprise. Many of these, however, are staffed by illiterate *dais* who are incapable of keeping records, or even of taking temperatures, and who have a very limited knowledge of asepsis and isolation. If the numbers of these homes increase in India, as there is every indication that they will, the question of their supervision should be taken up without avoidable delay by provincial authorities. The number of trained midwives available for midwifery work in the homes seems to be most inadequate. The employment of midwives by local authorities is not compulsory, but many municipalities and district boards have established domiciliary midwifery services. Madras Presidency would seem to be in advance of the other provinces in providing qualified midwives for work in the homes. The total number employed is 1,559, but even so as many as 50 per cent of all confinements are conducted by untrained attendants in that province.

Training schools for midwives are said to be quite insufficient for the needs of the country. Legislation regulating the training and registration of midwives has been passed in eight provinces, and it is hoped that in time the number of training schools will be increased and the standards of training improved. Apart from the scarcity of training schools and of trained midwives, a serious handicap exists in the lack of supervision of the midwives and their practice.

The account given of child welfare work is not encouraging. Approximately 800 infant welfare centres have been established, while some 60 medical women and 250 trained health visitors are employed in maternity and child welfare services now in existence in the country. Unfortunately, a considerable number of the centres are said to be badly organized, their work is uncoordinated, their records are not properly kept, and the information which is collected is not made available for future planning.

The account of the organization in the different provinces reveals a variety of methods of control. In some cases, the work comes under the public health department, while in others it is conducted altogether by voluntary societies. This transfer of responsibility and control from the public health department would seem unwise.

Particulars are given of the facilities for training health visitors. It should be explained that a health visitor is a qualified midwife who has taken an extra course of study to enable her to specialize in maternity and child welfare work. Schools for the training of health visitors exist in Bombay, Delhi, Lahore, Madras, Nagpur, Poona, and Rangoon, and schools are expected to open shortly in Calcutta and Lucknow. Most of these schools are at present maintained by voluntary associations. This is in keeping with the practice which was followed in England when the child welfare campaign was in its infancy. But with the growth of the movement, the governing authorities realized their responsibilities and took over the schemes, thus leaving the voluntary associations free for other pioneer work. Provincial Governments in India may reasonably be expected at this stage to assume responsibility for the training of these health visitors.

Public health administration and organization

If Medical Officers of Health are to be of real value, they must be given some security of tenure. Experience in England showed that failure to provide such security was always a severe handicap to ordered advance in public health and India has already proved to be no exception in this respect. Instances could be quoted where health officers have been unable to retain their appointments for more than short periods because, as soon as they reported on glaring sanitary defects, vested interests represented on the municipal councils or local boards rendered their position intolerable. In order to prevent the development of such a situation, in other countries it has been found necessary to pass legislation making it illegal for municipal councils and local boards to dismiss an approved health officer without the sanction of Government. In a number of the provinces of India, local governments have already laid down this condition, so essential to progress, but the information supplied shows that, in other provinces, local authorities possess unfettered control over their officers.

The whole question of the organization and expansion of Public Health Departments is one deserving of serious notice from all interested in the health and welfare of this country.

Health units

A modern development in public health organization has been the establishment of health units. The idea of a health unit is to take a limited area and to staff it with adequate qualified public health personnel with the object of carrying out intensive work in different branches of preventive activity. This enables the administrator to gauge the response which is to be expected from the people. It also serves to demonstrate to Provincial Governments and to local bodies the progress which can be made if the question of public health is given the consideration, financial and otherwise, that it deserves. Further, if the work of the unit is successful, its accomplishments serve as an example to the population of the surrounding areas. The Rockefeller Foundation has been most generous in helping to establish these unts, usually by defraying half the cost over a period of about five years. The scheme is well developed in the United Provinces. The health unit in Partabgarh has been in existence for some years and nine 'modified' health units have been set up. In Madras, a health unit was established at Poonamalee working over an area of 25 villages with a population of 42,000. In Burma, the Hlegu Rural Health Unit had another successful year. In addition to the benefits which they confer on the villagers, these units are very useful as field training centres for public health students.

Health propaganda

A variety of health propaganda methods is reported from different provinces. Amongst the means adopted to capture the imagination of the people, with a view to enlisting their co-operation in the health measures designed for their benefit, are health exhibitions and health dramas, cinemas, broadcasts, lectures, magic lantern demonstrations, distribution of leaflets and posters and travelling cinema vans.

Particularly in recent years public health has become a matter of first-class interest to the editors of newspapers, and the daily and weekly press in India has usually given prominence to the notes on nutrition and other subjects which have issued in considerable numbers. Public health authorities are frequently asked for articles describing health activities or outlining certain schemes of public health improvement. The value of public health propaganda cannot be too strongly emphasized. The public must be got to realize that much of the ills from which they suffer can be prevented by improving their personal hygiene or the surroundings in which they live. In this way a public opinion will be created which will refuse to tolerate the unsatisfactory conditions which have been described in this report.

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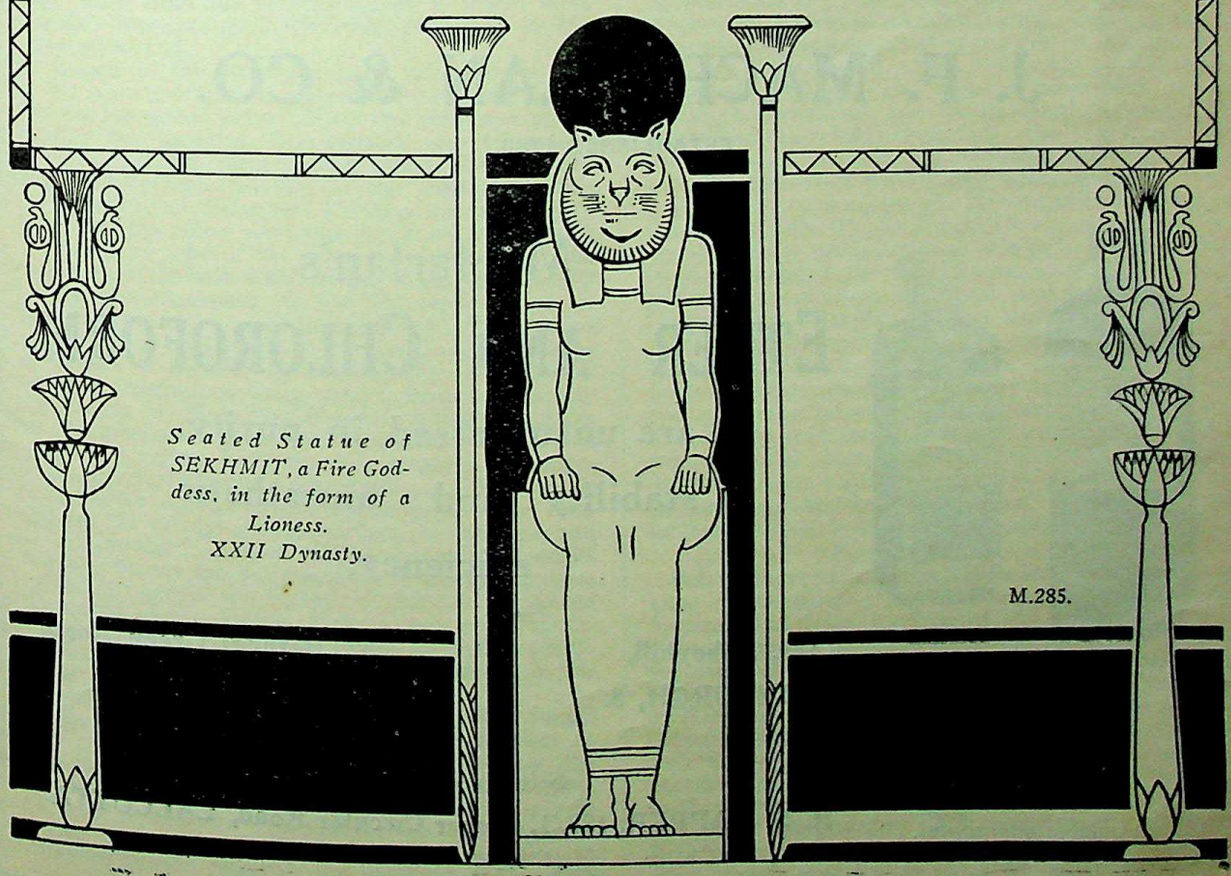

Seated Statue of SEKHMIT, a Fire Goddess, in the form of a Lioness. XXII Dynasty.

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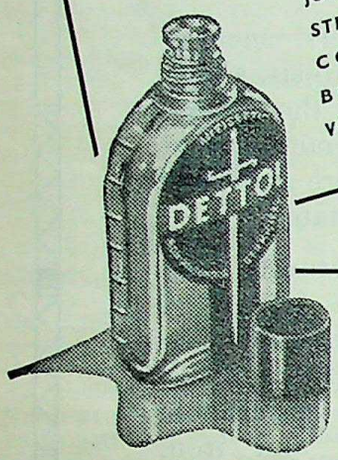

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ADULTERATION OF FOOD

Figures are given from the different provinces showing the number of food examinations carried out and the percentage of foodstuffs found adulterated. These reveal a state of affairs which seems to require drastic action. For example, the percentages of ghee samples found adulterated in the different provinces were as follows:—North-West Frontier Province, 41 per cent; Punjab, 45 per cent; United Provinces, 15 per cent; Bihar and Orissa, 58 per cent; Bengal, 45 per cent; and Assam, 52 per cent. The corresponding percentages for adulterated milk samples were North-West Frontier Province, 64 per cent; Punjab, 60 per cent; United Provinces, 7 per cent; Bihar and Orissa, 59 per cent; Bengal, 66 per cent; and Assam, 43 per cent.

Food Adulteration Acts are in force in a number of provinces but, whatever be the reason, these seem to be largely ineffective in protecting the public against fraudulent and dangerous substitutes in the food which they purchase. Administration of the Acts is in the hands of the local bodies, and it is not difficult to imagine that the vested interests of dishonest food merchants constitute an obstacle to their efficient working. The matter is one which requires to be thoroughly explored and it is understood that, as in the case of maternal and infantile mortality, an *ad hoc* committee is being set up under the Central Advisory Board of Health to report on the whole question of adulteration of food in India, and to make recommendations for stopping what seems a public scandal, if one is to judge by the figures given in the report.

INTERNATIONAL HEALTH ORGANIZATIONS

An account is given of the activities of a number of International Health Organizations and Conferences on which India was represented during 1935. The first of these is the Office International d'Hygiene Publique, Paris, which meets each year in May and October. The problems dealt with seem to cover a wide sphere. Among the subjects were international quarantine, sanitary provisions in the control of aerial navigation, and measures for the prevention of the spread of yellow fever. India is critically concerned with subjects such as these, and, from the account given, it would seem that India's interests were efficiently protected in the decisions arrived at.

The danger of the introduction of yellow fever into India has been a subject of concern to its public health authorities for many years. With the development of air traffic, the question has become one of urgent importance. During more recent times, the Government of India's representative at the meetings of the Office International d'Hygiene Publique has unfailingly impressed on his fellow delegates the grave view which his Government take of the potential danger, and the Government of India's attitude has been abundantly justified by recent events. In the first place, a new air route has come into operation between Lagos and Khartoum where it links up with the Capetown–Cairo route. There is therefore the possibility of infected persons and mosquitoes being carried from endemically infected areas in West and Central Africa to India within the incubation period of the disease. The recent discoveries of yellow fever research workers are calculated to give further cause for alarm. A new variety of yellow fever called 'jungle yellow fever' has been recognized. It chiefly affects workers on the land and is not contracted in houses. There seems little doubt that human beings are not essential to the continuance of endemicity nor to the spread of this new type. As the President of the Yellow Fever Commission of the Office International remarks, it would seem that jungle yellow fever in man is an accidental occurrence in the course of an epizootic among lower animals.

Laboratory findings have shown that this jungle yellow fever virus can be transmitted from monkey to monkey by the *Ædes ægypti* mosquito which is the most important vector of the urban type of the disease. If, as all recent work indicates, the virus of jungle yellow fever is identical with that of the urban type of the fever, the position in India is that, in addition to the immense human reservoir for the virus, there exists a vast monkey reservoir which could by no practical means be eliminated or controlled.

In regard to Africa, which is of primary interest to India in view of the rapid development of air traffic, investigations reveal that the disease is much more widespread than was generally considered to be the case. Positive mouse protection tests have been obtained in Egypt, the Anglo-Egyptian Sudan and in Uganda suggesting the presence of sporadic infection in the areas investigated. Those areas in which this test is positive but in which clinical cases of the disease, for one reason or another, have not yet been recognized are known as 'silent areas'.

It is therefore reassuring to read that in order to provide safeguards for this country, the Government of India in June and September 1936 issued notifications under the Epidemic Diseases Act which forbade the entry into India of any aircraft which has started from or alighted in a yellow fever endemic or 'silent' area, except such aircrafts which have obtained at Alexandria or Cairo a certificate of disinsecticization with 'Pyrocide 20' in the manner prescribed. These notifications also prohibited the entry into India of a passenger or a member of the crew of an aircraft within 9 days of his having been in an endemic or 'silent' area, unless he was protected by inoculation or by a previous attack of yellow fever.

The report gives further details of measures being taken not only to prevent infected mosquitoes reaching India from Africa, but also for the reduction of the yellow fever mosquito in the danger spots in India. Altogether the preventive campaign against yellow fever has a very serious bearing on the future welfare of India's millions. With the efficient prosecution of the measures in force and with the co-ordination of all those concerned, such as aircraft companies, port trust authorities, municipal councils, local boards and individual householders, it is hoped that the danger can be reduced to infinitesimal proportions and may, in fact, be entirely avoided.

The report gives a short account of the activities of the League of Nations Health Organization which continued to maintain its valuable service of epidemiological intelligence and public health statistics. A commission on biological standardization was engaged in working out international standards for a series of products, the assay of which could only be effected by biological methods. The malaria commission of the health organization has accumulated a wealth of specialized knowledge regarding the treatment and prevention of malaria by synthetic remedies. International courses of malariology were organized.

The health committee of the organization met in October and the Public Health Commissioner who is a member of the committee was able to be present, whilst he also attended the inter-governmental conference in the same month on biological standardization. The Government of India was also represented at a Pan-African health conference held at Johannesburg in November. The apprehension of the Government of India regarding the danger of entry by aeroplane of man and mosquito infected with yellow fever from Africa was clearly explained. Much information is required regarding the extent to which yellow fever is present in the African continent, and the conference made a strong recommendation regarding the necessity for further investigations on this important subject.

PUBLIC HEALTH WORKS

Successive reports of the Public Health Commissioner have emphasized the importance of environmental hygiene, and have emphasized the general failure of local authorities throughout India to provide good water supplies, good drainage and satisfactory means of removal and disposal of refuse and sewage. Until the local bodies are prepared to provide the funds for these primary essentials of environmental hygiene, the urban and rural population cannot hope to enjoy a reasonable standard of health. Undoubtedly, financial stringency in the year 1935 must have hampered the efforts of even the most enthusiastic and progressive committees. Looking towards future developments, it can be said that there is considerable scope for the employment by

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these committees of trained sanitary engineers. But until it becomes clear that the public health schemes in the towns and districts will provide careers for whole time sanitary engineers, it is unlikely that many students of the engineering colleges will start specializing in this branch of their profession.

One of the most crying and widespread needs in India is the provision of a safe supply of drinking water. The report states that 88 per cent of the urban population in towns with a population of over 50,000, 57 per cent of the population in towns with a population between 30,000 and 50,000, and 19 per cent in those with a population below 30,000 enjoy the benefits of a reasonably pure water supply. Speaking generally, a protected water supply in rural areas is of rare occurrence.

In some provinces, the local bodies are inclined to assume that no improvement is possible without a grant from the Provincial Governments. The general idea among the villagers is that any improvement must be carried out by the local bodies. Both points of view are erroneous and the truth lies between the two. To provide efficient conservancy, adequate drainage and safe water supplies for the whole of India's population would seem to be a superhuman task. Much immediate improvement could however be brought about if the idea of self-help became more general. In many cases, the villagers through their own labour could bring about a marked improvement. The campaign for rural reconstruction which has been taken up with enthusiasm has as one of its principal objects the development of this idea of self-help among rural populations. On the other hand, where the resources of the village cannot deal with the problem, the local body must play its part, and what is urgently required in this connection is the drawing up of practical schemes which are not too ambitious.

LABORATORIES AND MEDICAL RESEARCH

The report covers the activities of the Central Research Institute, Kasauli, the All-India Institute of Hygiene and Public Health, Calcutta, the School of Tropical Medicine, Calcutta, the Haffkine Institute, Bombay, the King Institute of Preventive Medicine, Madras, the Pasteur Institutes in Kasauli, Coonoor, Shillong, Rangoon, Calcutta, Bombay and Patna. Most of these institutions publish their own annual reports, which should be studied in order adequately to appreciate the variety and scope of the numerous researches which are being made. While most of the institutes are maintained by the Central or Provincial Governments, the special funds for particular researches are largely provided by the Indian Research Fund Association.

India has an unenviable reputation amongst other countries as being the home of cholera. It is appropriate therefore that research work should be carried out with a view to elucidating the reasons why cholera continues in endemic and epidemic forms in this country. In 1935, cholera research was pursued intensively. The work was shared between the Central Research Institute, Kasauli, the All-India Institute of Hygiene and Public Health, Calcutta, the School of Tropical Medicine, Calcutta, and the Pasteur Institute, Shillong, co-ordination being arranged by a Cholera Advisory Committee. This work was of a highly technical nature and resulted in a distinct advance in our knowledge regarding the identification of the particular organism which is responsible for cholera in epidemic form in India. Enquiries regarding the value of bacteriophage in the prevention and treatment of cholera were continued, but the results remain elusive and unconvincing.

In the field of malaria, an intensive year's work on the part of the Malaria Survey of India is recorded. This included entomological investigations, field work and surveys, and an enquiry into the efficiency of antimalarial drugs. Enquiries into the method of malaria transmission were carried out at the School of Tropical Medicine, Calcutta, while the All-India Institute of Hygiene and Public Health carried out a field enquiry with a view to evolving a cheap method of rural malaria control. Blackwater fever also was a subject of research at this institute. The Assam Medical Research Society carried out malaria enquiries, including an investigation into the breeding cycle of the *Anopheles minimus* which is the principal vector of the disease in that province.

Nutrition research was conducted in the Indian Research Fund Association Laboratory at Coonoor and at the All-India Institute of Hygiene and Public Health; this work is dealt with in the section of the report devoted to that important subject.

Enquiries were conducted in the Haffkine Institute, Bombay, regarding the relative values of plague vaccines made from heat-killed cultures and those made from live avirulent cultures. The standardization of plague vaccine and other factors in connection with its manufacture were also studied.

Space does not allow of details being given regarding other interesting and valuable researches carried out in the different institutes covering the subjects of leprosy, anti-rabic vaccine, tuberculosis, kala-azar, snake venom, the value of indigenous drugs, anæmia of women, drug addiction, typhus, the incidence of cancer, the etiology of cataract, splenomegaly, epidemic dropsy, helminths and fungi.

It is clear to the reader of the Public Health Commissioner's report that India's future well-being and happiness are closely bound up with the activities and success of her workers in the field of medical research. It is true that with increasing knowledge new discoveries in the medical world have ceased to be as dramatic as in the past, but the research of to-day is no less necessary and no less valuable on that account. Any lowering of the standards maintained by the medical research workers in India will only result in the slowing down of India's progress towards better health conditions for her people. The Indian Research Fund Association has played a brilliant part in the past in the attainment of those high standards which have commanded the admiration of research workers in other countries. It is imperative that these standards should be maintained.

NUTRITION

The question of nutrition has been on the programme of the League of Nations since 1925 and, after a period of preliminary study, a report was published reviewing recent progress in this field and describing what the public authorities in a number of countries had already done or proposed to do. The assembly of the League expressed the opinion that the health organization should continue to develop its investigations into nutrition and nutrition problems in relation to public health, and that the other technical organizations of the League should continue their enquiries, especially as regards those measures which have already been adopted in various countries for improving nutrition and mitigating the plight of agriculture.

The work on nutrition has been the subject of four reports by the League of Nations and the whole problem is still under consideration both at Geneva and in practically every country of the world. India has taken its due share in this task and the Public Health Commissioner was able to assure the health committee at one of its meetings in 1935 that India would collaborate with its work in this field in every way possible.

The Indian delegation to the ordinary session of the Assembly of the League of Nations held in September 1935 also stressed the importance of the question of nutrition in relation to public health, and one of the Indian delegates remarked that the Indian Government was devoting special attention to the questions of rural hygiene and health and housing of the rural population, problems so vast that the end in view could not be achieved for many years to come. They therefore welcomed the prospect of the Conference on Rural Hygiene in the Far East. This conference was held during August 1937, and it is not divulging any secret to state that the problem of nutrition was considered in detail by a committee of that conference.

The first part of Section XII of the Public Health Commissioner's report includes an up-to-date description of what has been done in this field in India during the past two to three years and as will be seen covers the work done right up to its date of publication. The

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first two pages of the note on nutrition give paragraphs from the May 1937 report of the health committee of the League of Nations in which the position is reviewed and which indicates the list of problems recommended for further study. These include: assessment of the nutritional state of children; nutritive food requirements during the first year of life; influence of climate on food requirements; the extent to which diets in common use fall below the standards recommended; and the optimum amounts of milk required at different ages. These subjects indicate the multifarious aspects which require consideration in dealing with what is a large and difficult problem.

In India, interest in the question of nutrition has grown rapidly, especially since the assumption of the Viceroyalty by His Excellency Lord Linlithgow, and it is to be noted that this country has by no means been behind others in the field of nutritional research. The Indian Research Fund Association has for some fifteen years past been financing research work on nutritional problems and Sir Robert McCarrison, the first Director of Nutrition Research in India, carried out pioneer investigations on different aspects of nutritional problems and demonstrated their importance to India long before the present world-wide interest was roused. The importance of many of the facts described and published years ago by Sir Robert McCarrison has, indeed, now only been generally recognized. The work which has been done within the last two years indicates that a very large proportion of the population of India is under-nourished, and that this mal-nourishment not only affects the mental and physical energy of the individual but increases the morbidity and mortality of the many infectious diseases to which the ordinary individual is subjected in this country.

The present Director of Nutrition Research in India has extended the work on nutrition to a remarkable extent. In 1935, for instance, a systematic survey of the nutritive value of Indian foodstuffs was begun in Coonoor and a few months ago a health bulletin was published which covered the results of that survey. The bulletin included tables giving the value of about 200 common Indian foodstuffs as regards their content of calories, proximate principles, calcium, phosphorus and iron; in addition, 160 foods were investigated for vitamin A and carotene content; a similar number of vitamin C content; and about 50 for vitamin B_2 content. That there is a great demand for information on this subject is indicated by the fact that within a few weeks the first edition of 10,000 copies of the bulletin, which had been wisely priced by the Government of India at the nominal charge of two annas, was completely sold out. Steps are also being taken to issue extracts from the bulletin in the form of leaflets, etc., both in English and the commoner vernaculars.

Dietary surveys are also being carried out both by the Coonoor and Calcutta research units. The preliminary results of these surveys in South India suggest that the diet of the average villager is even more deficient, from the standpoint of both quality and quantity, than earlier and more casual investigations had indicated, but such surveys take a very considerable time and have to be carried out with extreme care if they are to be of real value.

Attempts are also being made to study the effect on health and physique of different types of diet. To this end, enquiries have been carried out in day schools in South India. The Coonoor laboratories have also completed an enquiry into the 'state of nutrition' of some 5,000 school children in South Indian towns. This enquiry indicates that a high percentage of children is in a state of malnutrition, displaying symptoms of food deficiency disease. Striking evidence that average Indian children are in a subnormal 'state of nutrition' has also been provided by experiments with skimmed milk. These preliminary experiments indicate that skimmed milk, fed in comparatively small quantities, is a valuable addition to average South Indian diets. The fact that stomatitis, a common deficiency disease, disappears when skimmed milk is fed is of obvious importance. It must be remembered, however, that the addition of even small quantities of milk in the cheapest form involves a considerable percentage increase in expenditure on food. Investigations on several other lines are under way, and it may be anticipated that these and others will give additional information for the guidance of those who are concerned with improvement in the nutritional state of both children and adults.

About the middle of 1936 the Governing Body, Indian Research Fund Association, decided to form a Nutrition Advisory Committee, the members of which should have special knowledge of the problems associated with human and animal nutrition. The committee, with the Public Health Commissioner as Chairman, held its inaugural meeting in Simla in June 1936, when it was honoured by the presence of His Excellency the Viceroy who opened the proceedings. The nutritional committee issued a report shortly after its meeting and copies were circulated to all Provincial Governments by the Government of India. The committee in the first place drew attention to the need for a preliminary survey of the 'state of nutrition in relation to the dietary habits of the people', if the state of nutrition in India were to be improved. These preliminary surveys, it was recommended, should be carried out in representative areas throughout India. Emphasis was also laid on the Provincial Governments having at least one officer with special knowledge of the subject.

In accordance with the recommendation of the nutrition advisory committee the first course of training has been held at Coonoor, having been attended by a number of officers deputed by Provincial Governments. These officers have now returned to their provinces and it is to be hoped that their new knowledge will be of advantage.

The Governing Body, Indian Research Fund Association, in accordance with another of the recommendations made by the nutrition advisory committee have appointed an experienced officer whose duty will be to develop and maintain a closer liaison between human nutrition work and agricultural research. This officer, having completed his six months' training at Coonoor, is now working at the Imperial Agricultural Research Institute in Delhi, where he will keep in immediate touch with the research activities of workers in the agricultural field. At the present moment little attempt has been made to make any exact definition of this officer's duties and functions, but it is expected that time and experience will indicate the lines along which his activities can best be directed.

Another of the recommendations made by the nutrition advisory committee has been given effect to and three field workers on nutrition have received a training in Coonoor with special reference to dietary surveys; they will be engaged in different parts of India on this work.

Additional work was carried out during the cold weather of 1936-37 by Dr. Curjel Wilson, lately a member of the Women's Medical Service, under the auspices of the Royal Society of London, which gave her a grant from funds originally placed at the disposal of the Royal Society by an Indian philanthropist. The data collected by Dr. Wilson in the Punjab and Delhi Provinces are now under statistical examination and will shortly be available to the Governments concerned. Dr. Wilson is extending her work to other areas during the forthcoming cold weather and will not only visit Kashmir but will also make surveys in the Central Provinces and in Orissa. These surveys are, it must be remembered, the very basis of nutrition work, and it is essential for success that they should be prepared as accurately as possible. Although inaccuracies are difficult to avoid, every error detracts heavily from their value.

The nutrition advisory committee also recommended that an Assistant Director of Nutritional Research should be appointed in order to give the Director further time to develop and control new activities in addition to the experimental and laboratory research units which have during recent years continued to expand in different directions. This officer will shortly take up his appointment in Coonoor.

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All these activities would be of little avail if the results obtained were not brought home to the people themselves. The subject of propaganda, or as His Excellency put it in his address to the nutrition committee, the need for practical application in the homes of the people of the fruits of research, is also being energetically pursued. It will be remembered that Sir Robert McCarrison published a small book entitled *Food* in 1923. This has gone through several editions and it has been translated into a number of vernaculars, and whilst it has been widely used by those in charge of hostels, boarding schools and similar institutions, further propaganda work has been done by means of the health bulletin already referred to. Whilst periodical notes, such as those issued from the nutrition laboratories on the value of skimmed milk, are issued to the press in the hope that the information contained therein will reach the people for whom it is intended, other arrangements are also under way, such as the preparation of series of coloured posters, etc. In the same direction, a certain amount of educational work by means of pamphlets and posters is being carried out by provincial public health departments and voluntary associations. But much more remains to be done before one can bring to the notice of the average villager the practical results of scientific research and get him so to adjust his diet as to give him the best value for his expenditure on food materials.

Some details are given in the report as to the expenditure incurred by the Indian Research Fund Association on nutritional research. The average cost of the maintenance of the nutritional research laboratory at Coonoor has amounted to over Rs. 82,500 per annum. Six other grants for nutritional research have been made to different workers, including those in Indian Universities, and in order to implement the recommendations of the nutritional advisory committee, the Indian Research Fund Association have earmarked an additional sum of Rs. 1.5 lacs.

DRUG ADULTERATION

Following on the publication of the Drugs Enquiry Committee's report in 1930, which comprised an exhaustive examination of the whole question of the control of the import, manufacture and sale of drugs and medicines in India, and a discussion in the Council of State during 1935, the Government of India again impressed on Provincial Governments the need for action and enquired whether, in view of the urgency of the problem, they would be prepared to adopt the recommendations made in the report. The establishment of a central drug-testing laboratory was also made the subject of reference.

As a first step towards the effective control of drugs and medicines in India, the Government of India have recently established bio-assay and pharmaceutical sections of a central drugs laboratory under the guidance of the Director of the Tropical School, Calcutta. These sections were opened in March 1937, being temporarily accommodated in the All-India Institute of Hygiene and Public Health. The technical staff includes a pharmacologist, a senior experimental assistant, a pharmaceutical chemist and a biochemist.

It will probably be necessary later on to open a further section for the testing of sera and vaccines; evidence already shows that these substances require a degree of control which does not yet exist in this country. It is obviously desirable that the drug control scheme should develop gradually, as experience indicates lines on which further advance is necessary.

It is to be noted, however, that one of the essential parts of the scheme is the development of a suitable laboratory in each province, as of course it is impossible for one central laboratory to deal with the whole of India. In addition, under the new Constitution, control of drugs is vested in Provincial Governments, but it will be necessary to evolve some arrangement by which co-ordination can be effected between Provincial Governments' laboratories and the Central Government's laboratory.

The Drug Enquiry Committee's report visualizes that the central laboratory will undertake commercial testing of drugs for manufacturers and dealers on payment of fees. In a country like India where the drug manufacture industry is in its infancy, the expert advice such as will be available in the central laboratory should be of great assistance in the development of this important industry. A number of manufacturing firms already in existence in this country has at present no means for proper testing and standardization, and they will probably welcome the assistance which the Central Government's laboratory can give.

Correspondence

SIPHUNCULINA FUNICOLA (EYE-FLY)

To the Editor, *The Indian Medical Gazette*

SIR,—In your January 1938 number, Mr. M. M. Syddiq has published a short résumé of the life history of the eye-fly, *S. funicola*. It is however necessary to mention that Jepson and Pinto (1927), in the Ceylon Government Agricultural Service, have previously studied the life history, and bred the flies artificially on a variety of dead organic matter: they lived as much as six weeks in captivity, and did not breed on growing plants, as is usual in the *Oscinidæ*, to which family they belong.

Later on, D. N. Roy (1928) found that they were breeding naturally in cattle sheds, where the earth was sodden with excreta, and Syddiq has restated this matter thus, 'the breeding place *par excellence* is moist mud, particularly that contaminated by decomposition of organic matter. The damp soiled earth around improperly kept pail latrines is a favourite breeding place; breeding has been found in badly-kept cattle stables and more frequently in connection with badly-kept and contaminated surface drains'.

As the natural source of the pest is an important matter in some districts, particularly in the tea gardens, it will be seen that Dr. Roy should be given prior credit for his observations.

It is scarcely necessary to advise on any course of action.

REFERENCES

Jepson, F. P., and Pinto, M. P. D. *Tech. Reps.* 1927. *Dept. Agric., Ceylon,* Colombo. (Abstract—*Rev. Applied Entomol.,* 1929, Vol. XVII, p. 22).

Roy, D. N. (1928). A Note on the Breeding and Habits of the Eye-fly *Siphonella funicola* Meij. *Indian Med. Gaz.,* Vol. LXIII, p. 369.

Yours, etc.,

C. STRICKLAND, M.A., M.D.,
Professor of Medical Entomology.

SCHOOL OF TROPICAL MEDICINE,
CALCUTTA,
2nd March, 1938.

[*Note.*—Jepson and Pinto failed to find the natural breeding sites of these flies, but were able to breed them in the laboratory on decaying animal and vegetable materials.

D. N. Roy investigated the matter further by placing longcloth meat-safes over different sites. Some nine different types of site were tested, with the following result: 'Only dung and urine and sodden earth in cattle sheds yielded the flies and then on four occasions; only thirteen eye-flies in all were caught from these sites.

With this single experiment it cannot be said that finality on the subject of the breeding habits of eye-flies has been reached, and we are glad that M. M. Syddiq, who appears to have overlooked these earlier references, took up the matter again.

His conclusions appear to have been reached independently, as in answer to a letter in which we asked him for his authority for the statement regarding the breeding sites of eye-flies, he replied as follows:—

'Sir,

With reference to your letter of the 11th March, 1938, I have to inform you that different types of eggs are found at such places. Mud was collected and the

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different types of eggs separated out and bred on boiled mud separately. Details about the eggs were recorded and drawn beforehand. One particular type of egg—described in the text—ultimately developed into eye-flies. Later, eye-flies obtained in nature were made to breed on boiled mud obtained from the places described. The eggs thus obtained were compared with those obtained in nature and found identical. This has been repeated several times under rigid laboratory conditions with the same result. I cannot quote any authority for I have not come across any literature on the subject. I should be much obliged if anybody could point out to me any literature dealing with flies of this type and detailed laboratory technique about preservation of larvæ in their natural condition.

Yours, etc.,
M. M. SYDDIQ, M.B.B.S., L.R.C.P., M.R.C.S. (Eng.), D.O.M.S. (Lond.), D.P.H., D.T.M. & H. (Lond.),
Chief Malaria Officer,
Hyderabad, Deccan.

HYDERABAD, DECCAN,
24th March, 1938.

We believe that the sites mentioned by him do not by any means exhaust the possibilities for the breeding sites of these pests and we consider that there is still room for further work on the subject.—Editor, *I.M.G.*]

PISTIA STRATIOTES AND *MF. MALAYI*

To the Editor, *The Indian Medical Gazette*

SIR,—In the control of human filarial infection of the type associated with *Mf. malayi* in the blood, Mr. Iyengar in the *Indian Medical Gazette* of May 1937 (pp. 300–307) and Drs. Sweet and Pillai in the *Indian Medical Gazette* of December 1937 (pp. 730-734) report striking success by biological means during the period 1933–37 under the auspices of the Government of Travancore. The object was simply the eradication of the water plant *Pistia stratiotes* as a species-sanitation measure directed against species of the sub-genus *Mansonioides,* which are the vectors of the disease in North Travancore. Rodenwaldt (1934), in Java, also mentions the correlation of *Pistia stratiotes* with vectors of *Mf. malayi,* and suggests control by eradicating pistia from swamps.

In Assam there are two hyperendemic foci of the particular type of filarial infection associated with *Mf. malayi,* one in the Surma valley and another in the Assam valley, that I have investigated, both comparatively limited in extent and the same species of *Mansonioides* are incriminated as carriers, *i.e., M.* (*Mansonioides*) *uniformis, M.* (*Mansonioides*) *indiana* and *M.* (*Mansonioides*) *annulifera.* In Assam, however, the pistia plant is by no means the only agent in the life history of *Mansonioides,* but even more prominently there are the water hyacinth and the type of sedge grass growing in swamps and sluggish waterways known locally as *dol* grass, and there may be others. The larvæ and pupæ of these species are to be found abundantly in nature on the roots of the two last-named aquatic plants, even more so than on pistia roots, and *M. uniformis, M. annulifera,* and in addition *M. longipalpis* adults have been readily hatched out from the younger forms, and there is no reason to suppose that *M. indiana,* which is closely related and very similar to *M. uniformis,* cannot be hatched in the same way. Furthermore, one heavily infected area has no pistia within about three miles.

It is obvious then that in Assam pistia eradication would not provide the beautiful example of species sanitation that it has done in Travancore, and when one considers the almost universal occurrence of water hyacinth and *dol* grass sedge in the swamps and undrainable stagnant-water areas in the plains of this province the prospect is almost as depressing as it was before. When I add that in the areas mentioned, *Anopheles hyrcanus* var. *nigerrimus* also is almost an 100-per-cent carrier of the infection, the problem becomes even more difficult.

The subject-matter of this letter and the incidence generally of both types of filariasis in Assam will be amplified in an article to be published shortly by myself, but meantime I merely wish to point out that each focus of filariasis in a district, like malaria, constitutes a separate problem in the light of local conditions and it would be regrettable to generalize, and apply remedial measures empirically, without special investigation.

Yours, etc.,
G. FRASER.

LABAC CENTRAL HOSPITAL,
DEWAN P. O.,
CACHAR,
9th March, 1938.

Service Notes

APPOINTMENTS AND TRANSFERS

Appointment—Personal staff

THE Viceroy and Governor-General has been pleased to make the following appointment on His Excellency's personal staff:—

To be Honorary Surgeon

Colonel A. F. Babonau, C.I.E., O.B.E., *vice* Colonel S. G. S. Haughton, C.I.E., O.B.E., V.H.S., vacated. Dated 28th January, 1938.

The Secretary of State for India has appointed Lieutenant-Colonel G. A. Khan to the Civil Branch of the I. M. S. from 1st April, 1937. He will count his seniority in Civil employment from the 5th June, 1930.

Lieutenant-Colonel H. H. Brown to be Officiating D. D. M. O. W., Army Headquarters. Dated 8th February, 1938.

Lieutenant-Colonel A. C. Craighead to be Officiating A. D. M. S., Bombay District. Dated 14th February, 1938.

Lieutenant-Colonel D. F. Murphy, M.C., to be Officiating A. D. M. S., Baluchistan District. Dated 17th February, 1938.

Lieutenant-Colonel J. C. Bharucha, Principal, Medical School, Agra, is appointed Officiating Civil Surgeon, Agra, in addition to his own duties from 21st February, 1938, *vice* Major Lucas.

On return from leave, Lieutenant-Colonel J. H. Barrett was posted on general duty at the General Hospital, Mandalay, from the 23rd February, 1938, a.m., and as Civil Surgeon, Mandalay, from the 1st March, 1938, *vice* Lieutenant-Colonel W. J. S. Ingram proceeding on leave.

Lieutenant-Colonel S. L. Patney, Superintendent, Presidency Jail, is appointed to act as Inspector-General of Prisons, Bengal, in addition to his own duties, during the absence, on leave, of Lieutenant-Colonel M. A. Singh.

Major J. Carrey, Civil Surgeon, Saugor, is reverted to the Military employment and posted to the Indian Military Hospital, Rawalpindi.

Major E. G. Hurd-Wood to be Additional Medical Officer, Army Headquarters Establishments. Dated 1st February, 1938.

Major B. N. Hajra made over charge of the Barisal Jail to Dr. G. De on the afternoon of the 1st February, 1938.

Major J. E. Gray, on the expiry of his leave, is posted on general duty at the St. George's Hospital, Bombay, with effect from 18th February, 1938, pending further orders.

The undermentioned Officers are reverted to Military duty:—

Major B. N. Hajra, on 14th February, 1938, posted to C. I. M. H., Wana.

Captain A. K. Gupta, on 14th February, 1938, posted to C. I. M. H., Wana.

Captain A. K. Gupta made over charge of Berhampore Jail to Dr. B. N. Chakravarty on the forenoon of the 1st February, 1938.

Captain V. E. M. Lee whose services have been placed at the disposal of the Government of the C. P. and Berar has been posted as Civil Surgeon, Saugor.

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Captain G. W. Miller whose services have been placed at the disposal of the Government of C. P. and Berar has been posted as Civil Surgeon, Chhindwara.

Captain B. J. Griffiths assumed charge of the Civil Surgeoncy of Jhansi on 5th February, 1938.

The undermentioned I. M. S. Officers were transferred to Civil employment :—

Captain B. A. Porritt, on 4th February, 1938, to Civil Madras.

Captain C. F. Garfit, on 22nd January, 1938, to Civil Punjab.

Captain G. W. Miller, on 1st February, 1938, to Civil Central Provinces and Berar.

Captain V. E. M. Lee, on 25th February, 1938, to Civil Central Provinces and Berar.

To be Captain (on probation)

Williams Sharp Davidson. Dated 1st January, 1938, with seniority as Lieutenant, 23rd December, 1933, and as Captain, 23rd December, 1934.

[This is evidently in supersession of the previous notification, *vide* page 190 of the March number—Editor, *I.M.G.*]

The undermentioned Officers are restored to the establishment:—

Lieutenant A. E. B. deCourcy-Wheeler, 1st January, 1938.

Lieutenant G. B. Jackson, 1st January, 1938.

Lieutenant C. W. Greene, 1st January, 1938.

To be Lieutenants (on probation)

1st January, 1938

William McIntyre Wilson, with seniority from 1st July, 1937.

William Loren Fennel, with seniority from 1st January, 1937.

Thomas Arthur Cunningham, with seniority from 1st January, 1937.

Desmond Rantzen Hanbury, with seniority from 1st January, 1937.

Francis Cleon Griggs, with seniority from 10th June, 1937.

Arthur Hamilton Booth.

James Walsh Lillico.

Duncan McCallum Black.

James Gordon Fife.

LEAVE

Colonel A. F. Babonau, C.I.E., O.B.E., A.D.M.S., Bombay District, proceeded on five months and one day's combined leave ex-India from 14th February, 1938.

Colonel A. C. Munro, A.D.M.S., Rawalpindi District, proceeded on two months' privilege leave from 21st February, 1938.

Lieutenant-Colonel W. J. S. Ingram is granted twenty-eight months' leave, preparatory to retirement, from the 1st March, 1938.

Lieutenant-Colonel E. S. Goss is granted privilege leave for two months with effect from 15th March, 1938, or date of availing combined leave on private affairs ex-India up to 25th September, 1938, pending retirement.

Lieutenant-Colonel C. M. Ganapathy, M.C., D.P.H., Director of Public Health, is granted leave for six months with effect from the 23rd March, 1938, or the date of relief.

Major T. H. Thomas, Officiating Professor of Medicine, Medical College, Calcutta, is granted leave for six months with effect from the 2nd February, 1938, in extension of the leave already granted to him.

Major E. S. S. Lucas, Civil Surgeon, Agra, on leave from 21st February, 1938.

PROMOTIONS

Lieutenant-Colonel to be Colonel

C. A. Wood. Dated 10th August, 1937, with seniority from 28th July, 1934.

Major to be Lieutenant-Colonel

A. K. Sahibzada, O.B.E. Dated 30th January, 1938.

Captain to be Major

G. Milne, I.M.S. Dated 4th August, 1937.

Promotion of the following I. M. S. Officers to the rank of Major is antedated as noted below :—

E. G. Hurd-Wood. Dated 30th November, 1934.

A. V. O'Brien. Dated 1st April, 1937, with seniority from 15th February, 1937.

H. S. Waters. Dated 4th February, 1938.

C. F. J. Cropper. Dated 8th February, 1938.

S. Lal. Dated 10th February, 1938.

RETIREMENT

Lieutenant-Colonel A. D. Stewart. Dated 13th January, 1938.

Notes

'TABLOID' FERROUS CHLORIDE, CITRATED

MANY authorities consider that ferrous chloride provides the most satisfactory means of administering iron. Hitherto, however, the use of this salt in medicine has been hindered by its tendency to rapid oxidation and consequent reduction in therapeutic efficiency. Experiments with various stabilizing agents have resulted in the introduction of citrated ferrous chloride now official in the *B. P. Addendum*, 1936. Burroughs Wellcome and Company issue the preparation as 'Tabloid' ferrous chloride, citrated, gr. 3, in bottles of 100. The product is sugar coated and is claimed to resist oxidation and deliquescence under all climatic conditions. It is directed to be taken after food with a copious draft of water.

AN ATTRACTIVE CALENDAR

WE have received through their agents in India a copy of the very attractive calendar issued by Messrs. Cow and Gate, Limited, makers of the well-known infants' food. This is a reproduction of a portrait of the two Royal Princesses, Elizabeth and Margaret Rose, and is a most tasteful and artistic production, free from advertising matter as befitting such a subject.

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Original Articles

THE ANÆMIAS IN PREGNANCY

A HÆMATOLOGICAL, CLINICAL AND STATISTICAL STUDY

By SUJATA CHOUDHURY, W.M.S.
Lecturer in Medicine, Women's Medical School, and Physician, Lady Lyall Hospital, Agra

and

VANMALI S. MANGALIK, M.D. (Luck.), D.C.P. (Lond.)
Lecturer in Pathology, The Medical School, and Pathologist, Thomason Hospital, Agra

WHILE numerous references had been made in other countries, as early as 1919, to the peculiar character of anæmia associated with pregnancy (Osler, 1919; Bardy, 1924; Larrabee, 1925), the importance of this problem has only been appreciated recently. The first account of this condition in our country was published by Margaret Balfour in 1927, who carried out an enquiry by issuing a number of questions to various hospitals, and studied some cases in the hospitals of Bombay. No systematic hæmatological study had been done in her cases. Mitra (1931) published a report of cases of anæmia of pregnancy from the Chittaranjan Seva Sadan with a post-mortem study of one case, and clinical notes on 86 cases.

Wills in the same year (1931) drew attention for the first time to the existence of a 'pernicious anæmia' of pregnancy which in her opinion closely resembled the tropical macrocytic anæmia. She published a report of about six cases, and stressed the recovery of these cases with marmite.

Recently, Mitra (1937) has published a report of a large series of cases of pregnancy associated with anæmia, and has tried to classify these into various clinical types.

The first systematic study from the hæmatological point of view has appeared very recently (Napier and Billimoria, 1937), an 'analysis of the hæmatological findings in 52 cases of anæmia amongst pregnant tea-garden coolie women'.

The immense importance of the problem and the fact that the incidence of anæmia in pregnant women in our country seems to be more than in other countries, and also that little hæmatological study has been done on these cases in our country, may be some justification for the addition of this paper to those already published. As far as we know, no paper has appeared from the United Provinces dealing with this subject, and it is hoped that the following observations will be of help, however meagre, in the ultimate elucidation of the cause of this condition, which is responsible for so much ill health and mortality in the women of our country.

The type of material used in our cases differs from Napier's, in that in all our cases there was no discoverable cause of anæmia in these women, such as a history of chronic malaria or kala-azar, or any helminthic infection. Stool examination for ova of intestinal parasites was negative in all cases.

Material on which investigations were carried out

In all 41 cases have been investigated. Cases were all from the Lady Lyall Hospital, Agra, and were admitted during the months of July to December 1937. All new patients were examined soon after admission by one of us (S. C.) and their hæmoglobin estimated at the bedside by Tallqvist's blotting-paper method, and only those cases that showed a hæmoglobin value of less than 50 per cent were investigated more fully and included in this series. The majority of the patients belonged to the poorer or lower middle class of people. The hospital is one of the chief maternity hospitals in the town and makes provision for *purdah*-observing patients as well. Most of the Indian patients who seek hospital aid are suffering from severe grades of anæmia and the minor grades of anæmia are seldom met with in the wards.

In addition to the complete investigation of the 41 cases, a statistical survey has been made from two years' records of the Lady Lyall Hospital with a view to working out the incidence of age, seasonal variations, relation to number of pregnancy, etc. No attempt has been made to classify those cases which were admitted before July 1937 into hæmatological types, because complete blood records were not available.

Investigation

All cases were subjected to a thorough physical examination and the various systems carefully searched for any abnormality, though no *x*-ray examination could be made. A complete hæmatological examination was undertaken before the treatment was started.

All blood examinations were made on venous blood, partly because it is more convenient and accurate to work on venous blood and partly because all normal hæmatological standards, both in this country and abroad, have been based on venous blood and the examinations were carried out by recent generally accepted methods*.

Incidence of anæmia with pregnancy

Total number of cases confined in 1936 and 1937 ..	2,400
Total number of cases which showed anæmia ..	126
Incidence of anæmia with pregnancy	5.6 per cent

Age incidence

The accompanying chart (figure 1) shows the age distribution of anæmia. It occurs between

* In the paper, as submitted, a description of the technique was given, but we have omitted it in the interest of space.—EDITOR, *I. M. G.*

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15 and 40 years, and is frequent between the ages of 15 and 30 years, with a maximum incidence between 20 and 25 years, which corresponds with the maximum child-bearing period.

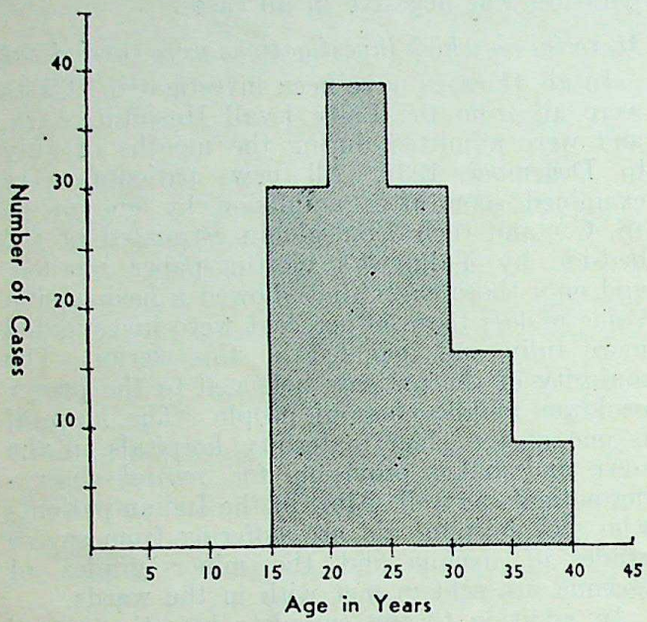

Fig. 1.—Age incidence.

Religion or caste

With this is linked the factor of vegetarians and non-vegetarians. All Hindu women in this series were strict vegetarians. Both Hindu and Mohammedan patients came from a similar class of society, the lower middle class. The impression so far has been that the anæmia is far more common amongst Hindu women. Balfour (1927) has also made a similar observation. A close study of the figures reveals that it is equally common in both the classes. This apparent low incidence of anæmia in Mohammedans is due to the smaller number of Mohammedan women seeking admission to the hospital for confinement.

	Total confinements	Confinements with anæmia	Percentage
Hindus	.. 1,750	90	5.1
Mohammedans	.. 540	34	6.3
Others	.. 110	2	1.8

Relation of anæmia to number of pregnancies

Figure 2 shows the greater incidence in primiparæ and the incidence of anæmia decreases in further pregnancies. Twenty-four cases were in primiparæ, 14 in the second pregnancy and more or less the same number in the third, fourth and fifth pregnancies. Mitra (1937) also observes the greater incidence in primiparæ.

Seasonal variation

Much seems to have been made of seasonal variation and incidence of anæmia with pregnancy. Mitra (1931, 1937) in Calcutta, Balfour (1927) and Wills (1931) in Bombay found this disease more prevalent during the second half of the year. Mudaliar (quoted by Mitra, 1937) has found it more prevalent in the hottest part of the year. We, on the other hand, find that the incidence of cases of anæmia seems to

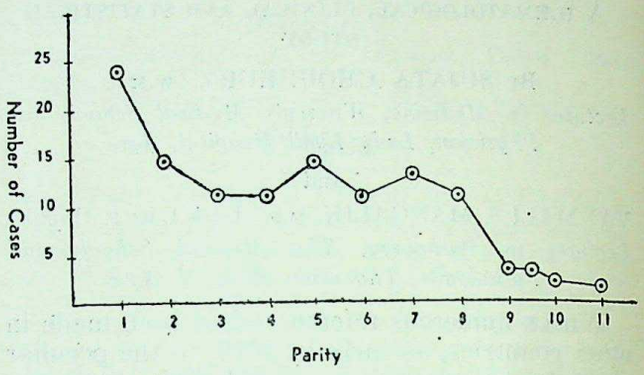

Fig. 2.—Relation to number of pregnancies.

be highest in the months of August to October, and this period also corresponds with a relative increase in number of cases confined in the hospital. The accompanying chart (figure 3) shows the seasonal variation of confinement cases and anæmia cases. There seems to be no real seasonal variation in anæmia cases, and

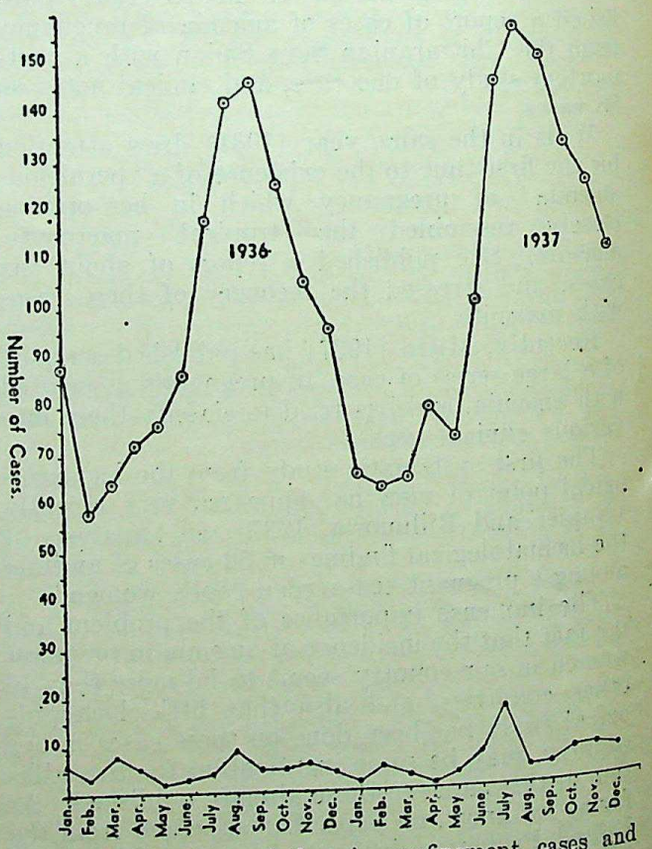

Fig. 3.—Seasonal variation in confinement cases and anæmia cases.

there is no reason why there should be more anæmia cases in the coldest part of the year in one province and the hottest part of the year in another, in the same country. As far as we know, anæmia in pregnancy is not due to an

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infective process. It is, in all probability, a deficiency anæmia, and, as such, we fail to find any explanation for the apparent seasonal variation reported by other workers.

Months of pregnancy and anæmia

Months of pregnancy	Cases of anæmia
5th and 6th	2
7th and 8th	36
9th and 10th	88

It will be seen that most cases came to the hospital during and after the seventh month of pregnancy, when the associated symptoms compel them to seek hospital aid. It is, therefore, difficult to say when the anæmia actually starts.

The analysis of 41 cases, investigated in this series, is as follows :—

Months of pregnancy	Macrocytic cases	Microcytic and mixed type
5th and 6th	2	0
7th and 8th	9	0
9th and 10th	16	14

This shows how macrocytic cases have a tendency to seek hospital aid in the earlier months, while the microcytic cases can go on to the ninth and tenth months without being compelled to seek hospital admission. It is perhaps not necessarily due to an earlier onset of the one type as opposed to the other, but because the severe constitutional symptoms, such as dyspnœa, œdema, and general depression, appear early with more severe anæmia of the macrocytic type and compel patients to come to hospital early.

Infant mortality

Fifty anæmic women confined, out of a total of 126 in two years, lost their babies. Most of the babies were born quite healthy, but they died during the first three to four weeks. This seems more than incidental. In the present series of 41 patients, 16 babies died and all of them of mothers who were suffering from macrocytic anæmia (27 cases), an infant mortality of over 50 per cent. Going carefully over the hæmatological findings of these cases, one finds that the infant mortality is not related to the degree of anæmia. Some mothers with a count of over 2 million red cells lost their babies, while in others with a count as low as four hundred thousand red cells the babies survived.

Classification

Various authors have classified anæmia in pregnancy into various types :—

Wintrobe (1934) classifies anæmia of pregnancy into : (*i*) Macrocytic, (*ii*) Normocytic, (*iii*) Simple microcytic, and (*iv*) Microcytic hypochromic.

Vaughan (1936) classifies them into various types of deficiency dyshæmopoietic anæmia and hæmolytic anæmia.

Adair, Dieckmann and Grant (1936) have proposed a simpler classification of (*i*) 'physiological' anæmia, (*ii*) hypochromic (subnormal hæmoglobin), and (*iii*) macrocytic, with a large mean cell volume and which they think is associated with toxæmia of pregnancy. Smallwood (1936) gives a logical and complete classification of anæmia and draws attention to the physiological type associated with hydræmia.

Mitra (1937) has grouped anæmia cases on the basis of some clinical data, such as anæmia of pregnancy associated with conditions like malaria, kala-azar, etc., whether in active or latent form, or cases without any clinical evidence of any of these conditions responsible for anæmia, which he names the idiopathic group. Napier and Billimoria (1937) have grouped their cases as :—

(*i*) Hyperchromic with marked anæmia.

(*ii*) Hyperchromic with slight anæmia.

(*iii*) Hypochromic microcytic anæmia.

(*iv*) Orthochromic normocytic anæmia which is not a distinct group.

There being some uncertainty about the cell volume estimations (the centrifuge was not efficient enough for the work), Napier grouped them according to the degree of hæmoglobin content of cells (MCH) rather than according to their size (MCV).

All these classifications have their own advantages and disadvantages. During the last few years, it has become recognized that most of the common types of anæmias are deficiency anæmias, due to the lack of one of the two main hæmopoietic substances, iron and the 'P. A.' factor (elaborated in the stomach from the interaction of the extrinsic and intrinsic factors); in the latter, the lack may be of either the extrinsic or intrinsic factor, or both. It is also recognized that iron deficiency leads to a microcytic hypochromic anæmia with a low MCV and a low MCH, and that the deficiency of either the extrinsic or intrinsic factor leads to a macrocytic hyperchromic anæmia, with a high MCV and a high MCH.

Wintrobe's hæmatocrit method of estimating mean corpuscular volume is becoming increasingly popular in laboratories. This is a method for estimating, with a fair degree of accuracy, the mean cell volume. The method is simple and can be used for routine work as well, without undue strain on the worker. It is not so elaborate and strenuous a technique, demanding hours of concentrated work, as is Price-Jones's method of determining mean cell diameter and is more reliable and accurate than the halometer.

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In view of the above, it seems justifiable to propose a method of classification which is based on determination of mean corpuscular volume as this will be easy for grouping the cases, and practical for following a specific line of treatment. It is proposed to group them as :—

(1) Macrocytic hyperchromic anæmia, characterized by high MCV of over 90 c.μ. and MCH of over 29 $\gamma\gamma$.

(2) Microcytic hypochromic anæmia with a low MCV and a low MCH.

(3) A mixed group—characterized by hæmatological findings which do not conform to any one of the two types, the MCV is in most cases on the higher side of normal, and the MCH is lower than normal. They are indicative of a dual deficiency of both the hæmatinic principles, iron and the P. A. factor.

The grouping of 41 cases in the present series was as follows :—

	Cases
(*i*) Macrocytic hyperchromic ..	27
(*ii*) Microcytic hypochromic ..	6
(*iii*) Mixed type	8

Clinical findings

The macrocytic hyperchromic group.—This forms the biggest group of anæmia cases associated with pregnancy. It has been given different names by different authors—'pseudopernicious anæmia of pregnancy', 'grave hæmolytic anæmia', 'tropical macrocytic anæmia of pregnancy'.

This type seems to be far the most common —27 cases as opposed to 14 cases of the other types, in a period of six months. Clinically, the cases were characterized by marked pallor of the face, conjunctiva and other mucous membranes, and a greenish complexion (lemon yellow). Most of the cases looked ill, restless and dyspnœic; dyspnœa was a sort of gasping for breath or air hunger. Most of them had a low intermittent fever. The general condition was so characteristic that it was possible, in most cases, to guess the hæmatological group.

Gastro-intestinal symptoms.—These were prominent, 20 cases complained of diarrhœa—about 15 to 20 motions a day. Stools were watery, without blood or mucus, and microscopical examination did not show any evidence of a dysenteric or helminthic infection. We were unable to trace any seasonal variation in the gastro-intestinal symptoms. The diarrhœa usually responded to liver treatment. Cases 5 and 17 were achlorhydric (case 17, even after histamine injection) and their diarrhœa, which was of a severe type, stopped after administration of dilute hydrochloric acid.

Vomiting was not a marked feature. None of them had it while in hospital, though a few gave a history of vomiting before admission to the hospital.

Spongy gums were noticed in most cases. Two cases (5 and 17) had swelling and bleeding from the gums. No soreness of the tongue was observed in any case.

The spleen was enlarged in 15 cases, varying from just palpable to about 5 finger-breadths below the costal margin. Twelve cases had no enlargement of spleen. History of fever with rigor was obtained in five cases. The spleen was soft and a reduction in size was noticed after treatment (except in the five cases with a previous history of malaria).

Cardio-vascular changes were marked. No radiological or electrocardiographic examinations of the heart were done. The apex beat was displaced outwards, indicating an enlarged left ventricle. Systolic hæmic murmur was heard at the pulmonary and mitral areas in all the cases. In four cases (5, 17, 22 and 39) an aortic diastolic murmur was heard, conducted down the left border of the sternum. The murmur was highly suggestive of aortic leak, which suggestion was strengthened by the high pulse pressure, a collapsing pulse, and increased pulsation in the carotids. The Wassermann reaction was negative and no history of previous rheumatic infection could be obtained. After treatment, as the anæmia and the general condition improved, the diastolic murmur also disappeared.

Some cases showed signs of congestive heart failure, such as fullness of the veins in the neck, epigastric pulsation, enlarged tender liver, and crepitations at the bases.

Œdema was present in all the cases. It was generalized but more marked in the lower extremities. Some cases had ascites as well.

The nervous system did not show any subjective or objective signs.

The microcytic hypochromic and mixed groups.—These cases formed a contrast in clinical picture to the first group. Their complexion lacked in the 'lemon yellow' tint, though pallor was marked and hæmoglobin values as low as 4 gm. (30 per cent) were encountered; the patients never presented the ill, restless appearance of macrocytic cases. Dyspnœa and œdema were of a mild degree; they had no fever, nor were their gums spongy. There was no ascites. Cardio-vascular symptoms were not so marked; enlargement of the heart was detected only in one case; only systolic murmurs could be heard. Gastro-intestinal symptoms, such as diarrhœa and vomiting, were absent. The spleen was not enlarged in any case, nor was the liver palpable. No koilonychia was noticed.

Hæmatological findings

The red cell counts.—In the macrocytic group these were comparatively low (the majority below 2 millions, 10 cases below one million); the microcytic group had counts between 2 and 3 millions, while they were variable in the mixed group.

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The mean corpuscular volume (MCV) and the mean corpuscular hæmoglobin (MCH).—These were characteristically high in the macrocytic cases. The MCV in most cases ranged over 95 c.μ. and values as high as 235 c.μ. were obtained. The MCH was over 30 $\gamma\gamma$ in all cases and in the majority between 35 and 45 $\gamma\gamma$. The microcytic group showed a low MCV between 60 and 80 c.μ. and MCH between 11 and 21 $\gamma\gamma$. In the mixed group MCV was on the higher side of normal, ranging between 90 and 103 c.μ. and MCH on the lower side of normal, between 22 and 27 $\gamma\gamma$.

Mean corpuscular hæmoglobin concentration (MCHC).—In the microcytic and mixed group this was below 30 per cent in all cases, and over 30 per cent in most cases of the macrocytic group.

The reticulocyte count.—This was extremely variable and did not point to any significant difference between the various groups.

Morphology of the red cells.—The macrocytic group showed apparent megalocytosis in severe cases, and anisocytosis and poikilocytosis were marked. Vacuolation of red cells was a characteristic feature of the microcytic group and some of the cells were mere empty envelopes. In the mixed type, one noticed some cells which were well filled, and also anisocytosis and poikilocytosis and also vacuolation of red cells. Nucleated red cells, primary erythroblasts, and megaloblasts were encountered in the macrocytic cases with counts in the neighbourhood of 1 million. It was rare to find these in the other groups. Normoblasts were seen in all the groups.

Total white cell count.—This did not reveal any significant difference in the various groups. The majority of the cases showed a low leucocyte count, of the order of 3 to 7 thousand per c.mm.

The differential white cell count in all the cases showed a relative increase in lymphocytes. In some macrocytic cases, it was noticed that the differential count returned to normal as the anæmia improved.

Van den Bergh's reaction.—The direct reaction was negative in all cases. The indirect was positive in 20 cases of the macrocytic group and in 4 cases of the mixed group. No quantitative estimation of blood bilirubin was done. All the microcytic cases had a negative indirect reaction.

The urobilin test in urine was positive in 6 cases of the macrocytic group, and 2 of the mixed group. It was negative in all cases of the microcytic group.

Gastric analysis.—We were unable to perform a gastric analysis in as many cases as we would have liked. Some of the cases were too ill on admission to be subjected to this examination, and, as soon as they felt better, either they refused the test or left the hospital. Gastric analysis was done on 18 cases in all and the findings could be tabulated as follows :—

Type	Achlorhydria	Normal	Low side of normal	High side of normal	Hypochlorhydria	Hyperchlorhydria
Macrocytic ..	2	1	2	5	2	1
Microcytic ..	..	..	..	..	3	1
Mixed ..	1	..	..	..	..	..

Out of these achlorhydric cases (5, 17 and 29) only two could be tested after histamine. Case 17 (macrocytic) remained achlorhydric and case 29 (mixed) secreted free hydrochloric acid after histamine.

The numbers are small, but the results do not indicate any distinctive or characteristic feature, except that most have free hydrochloric acid.

Wassermann reaction.—This was negative in all cases, except in cases 33 and 44, both of the macrocytic type.

Urine.—A catheter specimen was examined in all cases for albumin. It was negative in all cases, except three (15, 25, and 44). In case 15 urine was loaded with albumin and showed granular casts. She had marked vomiting and showed maniacal symptoms on the third day after confinement. She was taken home by her relatives and is said to have died the same day. Blood pressure readings of the three cases are tabulated below :—

Case	Albumin	B. P.	Vomiting
15	++	130/106	++
25	+	120/80	—
44	+	105/50	+

Treatment and course

General treatment was started soon after admission, and consisted of the usual nursing, good and light diet, and rest in bed. All cases were given glucose (pure B. P.) 3iv every 4 hours in water with lime juice or in milk with the feeds. Strychnine and camphor in oil subcutaneously were given as cardiac stimulants, when indicated.

Blood was taken and examined as soon as possible after admission, and the specific treatment was instituted only after the hæmatological examination. As far as possible *only one* hæmatinic drug was used in one case and the progress checked by frequent blood examinations. Teaching work and routine duties did not permit us to work out the reticulocyte response of the patients after treatment, as we would have liked to do.

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Macrocytic cases were treated with one of the following preparations :—

(*a*) Marmite (orally).

(*b*) Neo-Hepatex (Evans), intravenous or intramuscular injections.

(*c*) Liver extract (P. D. & Co.), intramuscular injections.

(*d*) Campolon (Bayer), intramuscular injections.

Marmite.—Lucy Wills (1933) stressed the importance and value of marmite in 'pernicious anæmia of pregnancy', and showed how a sharp reticulocyte response and marked improvement was noticed in the majority of the cases with counts even as low as 1 million. Napier (1936) also showed how tropical macrocytic anæmia in non-pregnant women and men responds to treatment with marmite. We are not in a position to question the findings of Wills with regard to the efficacy of marmite, but we believed that our cases were far too ill and required more energetic methods for the restoration of the blood picture than oral administration of marmite. Most of the women sought hospital admission either at full term or showed indications of a premature labour. Some of them were moribund and others would not take marmite with its peculiar flavour, smell or taste. Hence we resorted to other methods of treatment, such as injection of liver preparations.

One case (37) was, however, treated with marmite 5ii every four hours, for one week. We were satisfied that the drug was taken by the patient. The patient failed to respond after a week's treatment, the blood examination showed no improvement. The patient's condition became worse after confinement (7th day after marmite treatment). The red cell count came down to 0.3 million; we tried intravenous hepatex, but the patient died.

Neo-Hepatex (Evans).—In all, 18 patients were treated. Neo-Hepatex was given intramuscularly, 2 to 4 c.cm. according to the severity of the case, daily for about 10 days, on an average.

Three cases with a count of less than 0.5 million were given intravenous hepatex; 5 c.cm. diluted in 5 c.cm. saline were injected very slowly. Two cases with a low count in the neighbourhood of 0.5 million could not be given intravenous hepatex; they died after 2 or 3 intramuscular injections. In all, 14 cases showed marked improvement after treatment with neo-hepatex, 2 left the hospital before treatment, and 2 died. Dramatic improvement was seen even in severe cases (5 and 22) after 24 hours of intravenous hepatex. The restlessness, dyspnœa and even the œdema showed remarkable decrease, and the general condition steadily improved on intramuscular injections.

Campolon (Bayer).—Five cases (14, 20, 24, 43 and 45) were treated with campolon, 4 c.cm. intramuscularly for 4 days, followed by 2 c.cm. for about 10 or 12 days in severe cases (24 and 43). In others, the dose varied according to the severity of the case. Improvement was observed in all the cases.

Liver extract (P. D. & Co.).—This was given in two cases, 2 to 4 c.cm. intramuscularly for a few days. We failed to notice any clinical or hæmatological improvement in either after a week's treatment. Unfortunately both the cases left the hospital against medical advice.

Microcytic cases.—These were treated with iron ammonium citrate gr. xxx *t.i.d.* in mixture form. There was, in all cases, good response, and it was followed by marked clinical and hæmatological improvement from about the 3rd or 4th day. The mixture was well tolerated by patients, and, contrary to the idea entertained by some, was not attended by any gastro-intestinal disturbances. In none of the cases treated was hydrochloric acid administered to increase the absorption of iron.

The mixed group cases.—These were treated to start with by intramuscular injection of Neo-Hepatex for about a week, followed by administration of iron ammonium citrate. In most cases this was followed by improvement in the general condition and blood picture. The hæmoglobin went up and the MCV tended to come within normal limits.

Blood transfusion.—This was not resorted to in any case of this series. Even severe cases, we believe, are capable of recovery with such drugs as intravenous hepatex, followed by adequate doses of liver preparations by the intramuscular route.

Discussion

The problem of the anæmias in pregnancy has a special significance for those working in our country. While a large number of pregnant women in England and other countries suffer from anæmia during pregnancy, the anæmia is, in the vast majority of cases, an iron-deficiency anæmia due to a chronic blood loss and deficient intake of iron. This type of anæmia may be seen in this country, but seldom necessitates admission of pregnant women into hospitals for serious toxic or cardio-vascular symptoms. The type of anæmia which is common in pregnant women in this country is the 'grave type' of anæmia, named differently by various authors. In our present series of 41 cases, 27 cases were of macrocytic or the 'grave type'. To discuss the pathogenesis of this type of anæmia is not within the scope of this paper which is meant to be a study of clinical and hæmatological findings of the anæmias associated with pregnancy. There are a few facts, however, which are worth mentioning.

Lucy Wills (1931–1933), who named these cases tropical megalocytic anæmia of pregnancy, tried to distinguish them from true Addisonian pernicious anæmia by a few laboratory findings. The chief of these being :—

(*i*) A negative indirect van den Bergh reaction, (*ii*) the absence of urobilin in the urine,

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(*iii*) leucocytosis, and (*iv*) the presence of free hydrochloric acid in the stomach.

Napier (1936) reported positive indirect van den Bergh reaction and excess of urobilin in urine in 9 out of 11 cases of tropical macrocytic anæmia studied by him in men and non-pregnant women. The leucocyte count of his cases was on the lower side, the majority having a count between 3 and 6 thousand per c.mm. The cases, that he has studied, differ from cases of true Addisonian pernicious anæmia inasmuch as usually they show free hydrochloric acid in the stomach and are of a lower age group (20 years to 32 years).

In the present series of 27 cases of macrocytic anæmia (proved by determination of MCV), 20 had a positive indirect van den Bergh reaction and 6 had urobilin in the urine. The majority of the cases showed a leucocyte count below 5 or 6 thousand, a good many could be said to have leucopenia (3 to 4 thousand). Free hydrochloric acid was present in all except two cases of those examined.

Our cases thus show practically identical laboratory findings to Napier's cases of tropical macrocytic anæmia in men and non-pregnant women, except for cases 5 and 17—both of which were achlorhydric. Case 5 was a woman of 20, with a high leucocyte count and achlorhydria which was not confirmed by histamine injection. Case 17 was 35 years of age, she had a total white count of 3,600 per c.mm., a relative lymphocytosis (66 per cent), a positive indirect van den Bergh reaction, and an achlorhydria persistent after histamine injection. Her blood examination showed MCV 123.8 c.μ; MCH 42.6 $\gamma\gamma$; MCHC 34.8 per cent; reticulocytes 0.8 per cent; anisocytosis and poikilocytosis were present. One primary erythroblast and one normoblast were present per 100 leucocytes. She gave a history of a similar grave anæmia during her confinement last year, when she was treated in this hospital. In our opinion, the case was one of Addisonian pernicious anæmia complicated or precipitated by pregnancy. We are fully conscious of the opinion held by some eminent medical men in India that true Addisonian pernicious anæmia is very rare or does not exist in India.

The presence of a positive indirect van den Bergh reaction in Addisonian anæmia is not quite well understood. Some attribute it to the large size of the cells which are broken down more easily, though red cell fragility has been found to be normal. There seems, therefore, no justification for the view held by Wills that these cases are characterized by absence of positive indirect van den Bergh reaction, when we realize that the ultimate result of lack of either extrinsic or intrinsic factor leads to the lack of the same hæmopoietic principle (P. A. factor) and is characterized by macrocytosis. This view is also held by Napier (1936).

We, therefore, believe that the macrocytic anæmia in pregnant women, the so-called 'anæmia of pregnancy', is identical hæmatologically with tropical macrocytic anæmia as reported by Napier (1936). There is nothing characteristic or distinctive about the anæmia to be regarded as a separate entity. Both are characterized by a high MCH and MCV, a positive indirect van den Bergh's reaction, the presence of urobilin in the urine, and a low leucocyte count. They differ from the Addisonian pernicious anæmia in having free hydrochloric acid in the gastric secretion, and the absence of neurological lesions.

Like the tropical macrocytic anæmia, perhaps the macrocytic anæmia in pregnancy is also due to a lack of extrinsic factor in the diet of these women. Pregnancy either complicates or probably acts as an additional cause by increasing the demands on the body for hæmopoietic substances.

Whitby and Britton (1937) think that iron deficiency is most commonly met with in temperate climates, and that in the tropics it is more common than macrocytic anæmia. De (1930) stated that in Bengal nearly all the anæmias of pregnancy are of the secondary type, and that the average hæmoglobin of a Bengali woman is about 7 grammes per cent (50 per cent Haldane). The lower incidence of hypochromic anæmia associated with pregnancy in Indian women has been a surprise in this small series. Fullerton (1936) made a very extensive study of 'Anæmia in poor class women' of Aberdeen, and also of the 'Hypochromic anæmias of pregnancy'. The demands for iron during reproductive life depend on the following factors :—

1. Blood loss during menstruation.
2. Supply of iron to the fœtus, uterus, and placenta during pregnancy.
3. Blood loss at parturition.
4. Iron content of milk during lactation.

Fullerton (1936) has also shown that by a quantitative study of the loss of iron due to menstruation and pregnancy it is clear that the diets of poor women are very frequently inadequate to compensate for the iron demands of reproductive life.

Meat being a very important source of iron in the diet of non-vegetarians in this country, one believes that the daily intake of iron in the vegetarians is comparatively very low and inadequate. This low intake of iron, coupled with menstrual blood loss, and repeated and multiple pregnancies and parturition, ought to bring about a negative iron balance and a hypochromic anæmia in the vegetarian Indian women. It is surprising, therefore, that amongst women confined in the Lady Lyall Hospital from July to December 1937 only about one dozen cases of anæmia indicative of iron deficiency were seen.

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Relation of anæmia and 'toxæmia' of pregnancy

The idea seems to be prevalent that the so-called 'toxæmia' of pregnancy plays a part in the causation of anæmia. Balfour (1927) stated that anæmia of pregnancy was due to a 'toxæmia due to products of conception', and compares well with eclampsia inasmuch as both occur during the second half of pregnancy and in primiparæ. Mitra (1937) remarks, while discussing the value of glucose therapy in the treatment of such anæmia, that 'glucose acts as a detoxicating agent, neutralizing the toxin which seems to be one of the causative factors in the anæmia of pregnancy'. While not denying the existence of toxæmia in cases with pre-existing renal disease or in the pre-eclamptic and eclamptic conditions, we believe that the 'toxæmia' referred to in connection with these grave cases of anæmia is more the effect than the cause of the anæmia. To us, dyspnœa, or air hunger, restlessness, œdema, and even fever in some cases appear to be due to anæmia and the associated cardio-vascular disturbances. We have noted how in all cases the institution of appropriate anti-anæmic therapy is followed by a general feeling of well-being. They feel better and better as the anæmia improves and all the so-called 'toxæmia' symptoms, even fever, disappear. We freely administered glucose to our patients, and believe in its efficacy —not as a 'detoxicating' agent, but as a drug of immense value to the myocardium. Jocelyn Moore and Pillman-Williams (1936) undertook an investigation into the association of anæmia with toxæmia and found that the incidence of toxæmic signs or symptoms is much lower in iron-treated cases than in controls, and that when the hæmoglobin value is kept in the region of 90 per cent, the incidence of toxæmia is low.

The conception of toxæmia has been carried so far as to advocate termination of pregnancy for the treatment of anæmia. 'Cure is never vouchsafed', they believe, 'unless the pregnancy terminates'. The improvement observed after the termination of pregnancy or after confinement is not due to absence of 'toxic products from the fœtus', but to the cessation of extra demands for hæmopoietic principles thrown on the already exhausted and poor resources of the mother. We believe that cases can show good improvement with appropriate treatment and can go on to full term without any 'toxæmic' signs. Case 22 was admitted on 7th September with a red cell count of 0.66 million, MCV 132.1 c.μ. MCH 41.6 $\gamma\gamma$. She was gravely ill and in the 8th month of pregnancy. She was treated with intravenous and intramuscular hepatex, and was discharged on 23rd October with nearly 4 million red cells—MCV 86.9 c.μ. and MCH 28.7 $\gamma\gamma$. She was told to take iron ammonium citrate at home and was delivered of a healthy child on 27th November in the hospital without any untoward symptoms.

The name 'anæmia of pregnancy' appears to be misleading inasmuch as it gives the student of medicine the impression that the anæmia has some characteristic hæmatological and clinical features, directly brought about by pregnancy. We fail to find any evidence to show that anæmia in pregnant women is different from those of non-pregnant women or men. The macrocytic hypochromic group is hæmatologically identical with the tropical macrocytic anæmia as described by Napier (1936). The microcytic group is due to an inadequate iron intake of women made worse by pregnancy and parturition. Pregnancy either complicates or precipitates the anæmia owing to the demands of the growing fœtus on the hæmopoietic reserves of the mother.

Hence, we would prefer the use of the term 'anæmia (or anæmias) in pregnancy' to 'anæmia of pregnancy'.

Summary and conclusions

1. A statistical survey of anæmias in pregnancy from the records of a maternity hospital shows that in 2,400 confinements in two years the incidence of anæmia is 5.6 per cent.
2. It is equally common amongst the Hindus and Mohammedans.
3. It is more common in primiparæ, and the maximum age incidence is between 20 and 30 years.
4. There is no seasonal variation in its incidence.
5. Forty-one cases have been clinically and hæmatologically studied.
6. A simple and practical classification has been proposed, which is of value in applying the specific line of treatment.
7. The macrocytic hyperchromic type is common. In the present series of 41 cases, 27 cases were macrocytic hyperchromic (65.8 per cent).
8. The macrocytic group is identical with tropical macrocytic anæmia, as described by Napier, and is characterized by high mean corpuscular volume of over 90 c.μ. and high mean corpuscular hæmoglobin of over 30 $\gamma\gamma$, a positive indirect van den Bergh reaction, the presence of urobilin in the urine in some cases, low leucocyte count, and free hydrochloric acid in the gastric secretion.
9. The relation of 'toxæmia' with anæmia of pregnancy is discussed.
10. The term 'anæmia (or anæmias) in pregnancy' is preferable to 'anæmia of pregnancy'.

We take this opportunity of expressing our thanks to Lieut.-Colonel J. C. Bharucha, I.M.S., and Dr. U. F. M. Morton, W.M.S., Principals of the Men's and Women's Medical Schools, respectively, for the facilities provided and encouragement and help given for carrying out

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TABLE

Case number	Age	Religion	Hæmoglobin: Grammes, per cent	Hæmoglobin: Percentage	Red blood cells: R.B.C. (millions)	Red blood cells: Packed cell volume	Red blood cells: MCV normal = 89 c.μ	Red blood cells: MCH normal = 29 γγ	Red blood cells: MCHC per cent normal = 34	Red blood cells: Reticulocytes per cent R.B.C.	Morphology: Anisocytosis	Morphology: Poikilocytosis	Morphology: Vacuolation	Morphology: Polychromasia	Morphology: Primary erythroblast	Morphology: Megaloblast	Morphology: Normoblast	White blood cells: Total (thousands)	White blood cells: Polymorphs, per cent	White blood cells: Lymphocytes, per cent	Urobilin in urine	Indirect van den Bergh	Gastricacidity
Microcytic group																							
1	25	H.	3.85	28	3.40	21.8	64.1	11.3	17.6	1.6	±	±	+	—	—	—	—	7.9	42	51	—	—	..
3	30	H.	7.52	55	4.00	32.7	81.7	18.9	23.1	2.0	+	—	+	—	—	—	—	4.0	0	96	—	—	Hypo.
12	20	M.	5.50	40	2.52	21.8	86.3	21.7	25.2	2.4	+	+	+ +	—	—	—	1	6.3	64	35	—	—	Hypo.
38	30	H.	4.81	35	2.42	7.4	72.0	15.7	27.9	2.0	±	—	+ +	—	—	—	3	19.0	78	21	—	—	Hypo.
47	25	H.	3.85	28	2.62	..	..	14.6	..	4.6	—	—	+ +	+	—	2	—	3.4	25	75	—	—	Hyper.
49	29	H.	4.12	30	2.71	..	..	15.3	..	3 0	—	—	+ +	—	—	—	—	3.4	60	37	—	—	..
Mixed group																							
8	30	H.	8.80	64	3.55	32.7	92.1	24.1	26.9	1.7	—	—	+	—	—	—	—	5.7	60	37	—	—	..
11	20	H.	4.26	31	1.64	15.2	93.0	25.9	27.9	1.1	+	+	+	—	—	—	—	6.4	60	38	+	+	..
18	22	H.	4.53	33	1.75	15.2	87.2	25.9	29.7	3.4	±	±	+	—	—	—	1	10.7	77	21	—	+	..
29	25	H.	7.15	52	2.60	23.9	92.2	27.5	29.8	4.0	—	—	—	—	—	—	—	4.6	53	41	—	—	Achlor.*
31	18	H.	8.66	63	3.30	30.5	92.4	26.2	28.3	1.6	—	—	—	—	—	—	—	5.7	60	37	—	—	..
32	35	H.	2.20	16	0.95	9.8	103.2	23.1	20.4	1.0	+	+	+ +	—	—	—	—	17.0	77	24	—	+	..
36	22	H.	3.03	25	1.42	13.0	92.1	24.0	26.2	10.0	+	+	+	+	1	—	1	14.1	71	29	+	+	..
46	35	M.	3.16	23	1.39	..	..	22.7	..	..	+	+	+	—	1	—	—	6.6	..	..	—	—	..

MCV = Mean corpuscular volume. MCH = Mean corpuscular haemoglobin. MCHC = Mean corpuscular hæmoglobin concentration.
Gastric acidity = —. N + and N — = within normal range, on high side and on low side respectively.
* After histamine.

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TABLE

MACROCYTIC GROUP

Case number	Age	Religion	Hæmoglobin: Grammes, per cent	Hæmoglobin: Percentage	Red blood cells: R. B. C. (millions)	Red blood cells: Packed cell volume	Red blood cells: MCV normal = 89 c.μ	Red blood cells: MCH normal = 29 γγ	Red blood cells: MCHC per cent normal = 34	Red blood cells: Reticulocytes, per cent R. B. C.	Morphology: Anisocytosis	Morphology: Poikilocytosis	Morphology: Polychromasia	Morphology: Primary erythroblast	Morphology: Megaloblast	Morphology: Normoblast	White blood cells: Total (thousands)	White blood cells: Polymorphs, per cent	White blood cells: Lymphocytes, per cent	Urobilin in urine	Indirect van den Bergh	Gastric acidity
4	17	H.	1.37	10	0.37	8.7	235.6	37.1	15.8	6.0	+ +	+ +	+	3	—	3	10.9	41	57	—	+ +	.. Achlor.
5	20	H.	1.92	14	0.32	7.6	234.7	59.2	25.2	4.2	+ +	+ +	—	—	—	10	15.2	57	41	+	+ +	N — Hyper.
9	18	H.	7.15	52	1.95	21.8	111.7	36.6	32.7	0.6	+ +	+	—	10	—	—	4.9	11	87	—	+ +	..
10	35	H.	3.16	23	0.98	10.9	110.6	32.1	29.0	0.8	+ +	+	—	1	2	—	3.9	50	47	—	+ +	..
14	29	H.	5.36	39	1.20	15.2	127.1	44.6	35.1	1.0	+ +	+	—	1	2	—	4.5	43	55	—	+ +	..
15	30	H.	3.16	23	0.76	10.9	143.4	41.6	29.0	5.0	+ +	+	—	—	—	13	..	24	72	—	+ +	Achlor.*
17	35	M.	6.05	44	1.42	17.4	122.8	42.6	34.6	0.8	+ +	+	—	1	—	1	3.6	32	66	—	+	..
19	38	H.	5.09	37	1.26	14.1	112.4	40.4	35.9	3.0	+ +	+	—	3	—	3	3.4	9	83	—	—	..
20	23	H.	7.97	58	2.36	22.8	96.4	34.6	34.8	0.6	+ +	+ +	—	3	4	4	2.5	70	26	—	—	..
21	25	M.	6.87	50	1.72	16.3	95.0	39.3	43.1	4.5	+ +	+ +	+	—	—	—	7.2	59	39	—	—	..
22	20	H.	2.75	20	0.66	8.7	132.1	41.6	31.4	6.0	+ +	+	+	2	—	2	5.8	28	69	+	+	N +
23	40	H.	6.05	44	1.49	16.3	109.7	40.6	37.0	3.5	+ +	+ +	+	—	—	1	4.3	47	52	—	—	..
24	16	H.	3.43	25	0.71	9.8	123.5	38.4	35.0	2.8	±	+ +	+	—	—	2	11.7	61	39	+	—	..
25	30	H.	6.87	50	2.10	20.7	98.6	32.7	33.2	0.5	±	±	—	—	—	—	5.6	49	48	—	—	..
26	30	H.	6.60	48	1.79	16.3	91.3	36.9	40.3	1.0	—	+	—	—	—	—	7.7	58	42	—	—	..
28	30	H.	6.18	45	1.61	18.5	115.0	38.4	33.3	6.0	+ +	+ +	+	—	—	—	7.2	61	37	—	—	..
33	40	H.	7.70	56	2.21	27.2	123.8	35.0	28.2	3.5	±	±	+	—	—	2	4.8	36	60	—	+ +	N
34	24	H.	4.12	30	1.00	13.0	130.0	41.2	31.5	5.0	+	+	—	1	1	—	2.0	0	100	+	+	N + †
35	18	H.	6.05	44	1.49	16.3	109.7	40.6	37.0	3.0	—	—	—	—	—	—	3.8	63	36	—	—	N —
37	28	H.	3.02	22	0.61	8.7	126.5	49.5	34.7	2.5	+	+	—	2	—	—	4.2	22	78	+	+	N +
39	25	H.	1.78	13	0.30	5.4	191.2	62.7	32.7	2.2	+ +	+ +	—	—	—	—	6.0	30	68	—	—	..
41	23	H.	5.77	42	1.41	19.6	132.0	40.9	29.4	12.0	+ +	+ +	+	—	—	2	5.2	23	77	—	—	..
43	30	H.	2.75	20	0.80	9.8	122.6	34.3	28.0	5.0	+ +	+ +	+	10	10	—	..	6	92	—	—	..
44	30	H.	4.12	30	1.34	14.1	105.4	30.7	29.1	5.0	+ +	+ +	+	2	2	—	..	45	55	+	—	..
45	25	H.	4.81	35	1.27	..	..	37.8	..	3.0	+ +	+ +	+	—	1	1	3.1	55	40	—	—	..
50	22	H.	4.12	30	1.20	..	..	34.3	..	6.0	+ +	+ +	+	—	2	—	5.5	48	49	—	—	..
53	35	H.	2.47	18	0.50	..	..	49.5	..	5.0	+ +	+ +	+	1	2	5	5.7	47	23	—	—	..

† Wassermann reaction + + +.

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this investigation. Our thanks are also due to the staff of the Medical Unit at Lady Lyall Hospital and the Pathology Department at the Men's Medical School for their active co-operation and help.

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[*Note.*—In this very valuable contribution to the study of anæmia in pregnancy, there are a few points that seem to invite comment.

The statement that there were no helminthic infections in a series of 41 lower middle-class patients in India is hard to believe, although it is very probable that hookworm infection is a negligible factor as a cause of anæmia in this part of India.

It is a pity that in the age and parity graphs the writers have not given the figures for non-anæmic pregnant women, more particularly as they have exploded fallacies regarding the caste and seasonal distribution by this very means.

The writers say that this anæmia is probably due to a food deficiency and is therefore unlikely to be seasonal, as other workers have suggested. They are in the first place prejudging the case: it is from the epidemiological data that we hope to discover the ætiology of the disease and not *vice versa*. Secondly, it is quite conceivable that a variation in the seasonal incidence might be correlated with a variation in the food substances available at different seasons. Finally, Dr. Chatterjee (below) has shown that in Calcutta there is a seasonal variation in the *percentage* incidence of anæmia amongst pregnant women.

Early in the paper they dismiss malaria as a possible ætiological factor, but later they say that 15 out of 27 of their macrocytic cases had enlarged spleen and five gave histories suggesting chronic malaria. They do not explain the splenic enlargement in the other cases. We do not know whether the population from which their cases were drawn is a malaria-infected one, but if they had come from either Bengal or Assam, both very malarious provinces, we should not dismiss so lightly a 56 per cent incidence of enlarged spleen.—EDITOR, *I. M. G.*]

SOME CLINICAL ASPECTS OF ANÆMIA IN PREGNANCY IN INDIAN WOMEN LIVING IN BENGAL*

By HEMENDRA NATH CHATTERJEE, M.B.
Durbhanga Research Scholar, Calcutta University

IN the present paper some of the outstanding clinical aspects of this condition are given.

Age incidence.—This was determined in 53 cases. The results are given in table I.

TABLE I

Age incidence of pregnancy anæmia

	Cases	Percentage
Below 20 years ..	8	15
20 to 29 „ ..	36	68
30 to 39 „ ..	8	15
40 and over ..	1	2
	53	100

The great majority of cases belong to the second group, that is, between 20 to 29 years. The minimum age incidence is 16 years (3 cases) and maximum 40 years (1 case).

Race and caste distribution

This is shown in table II.

TABLE II

Race and caste distribution

	Cases of present series	Total admissions in 1935
Bengalee Hindu	47	19,143
Hindusthani Hindu ..	1	
Bengalee Mohammedan ..	2	1,900
Hindusthani Mohammedan ..	3	
Indian Christian ..	1	

The remarkably small number of Bengalee Mohammedans in our series can be accounted for by the fact that this community follows the *purdah* system more strictly and consequently the number of female members of their community who seek hospital aid is much less than that of the Hindu community.

Relation of the period of pregnancy to anæmia

The month of past attendance is shown below :—

TABLE III

	All cases	Macrocytic cases
3rd month ..	1	1
4th „ ..	2	0
5th „ ..	4	2
6th „ ..	5	2
7th „ ..	5	2
8th „ ..	8	2
9th „ ..	15	13
	40	22

* Abridged by Editor.

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As many of the cases sought medical advice after the anæmia was fairly advanced, it is not possible to say when the anæmia actually started, but the above figures show that anæmia can start before the third month of pregnancy and that many of the cases carry on up to or nearly up to the ninth month.

Relation of the period of pregnancy to the type of anæmia

There does not seem to be any relation between the type of anæmia and month of pregnancy. Thus, macrocytic anæmias have been found in practically all months of pregnancy from the third month onwards.

The microcytic and normocytic anæmias have also been observed in all the different months from the fourth onwards. Inasmuch as the macrocytic anæmia denotes a severe type of hæmatological condition, the occurrence of this type of anæmia in the earlier months of pregnancy indicates that the progress of anæmia must have been rapid in these cases.

Relation of number of pregnancies to anæmia.—In our series of cases, the history in 50 cases could be obtained with certainty. The figures obtained show that the anæmia does not seem to have any relationship to the number of pregnancies excepting that it is more liable to occur in the earlier pregnancies.

1st	pregnancy	10 cases
2nd	„	7 „
3rd	„	10 „
4th	„	9 „
5th	„	7 „
6th	„	3 „
7th	„	1 case
8th	„	1 „
10th	„	1 „
13th	„	1 „
		50 cases

Blood groups.—The blood grouping was studied in 34 cases and it was found that the subjects belonged to all the four groups as follows :—

TABLE IV

Showing incidence of the blood groups

		Percentage
Group A ..	6	18
„ B ..	18	53
„ AB ..	2	6
„ O ..	8	23
	34	100

The table shows that there is not much relationship between any particular group and pregnancy anæmia, although patients belonging to group B were the most numerous.

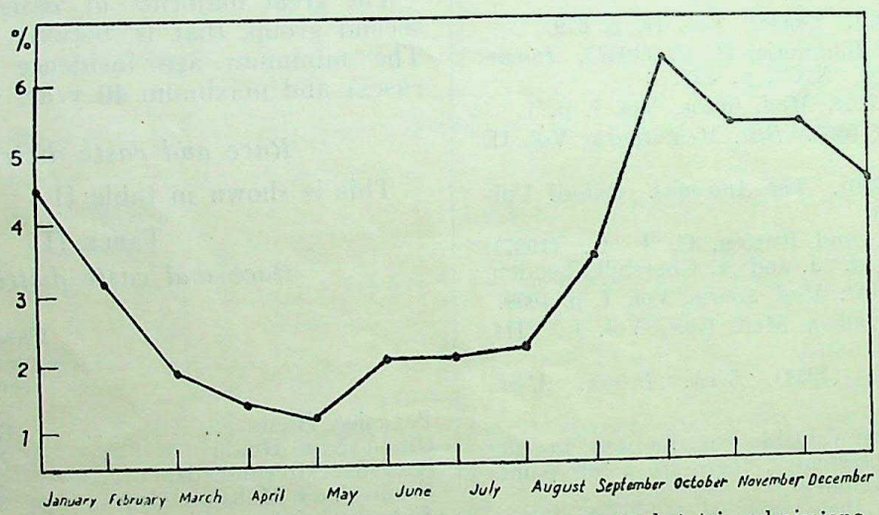
Matching of infant's blood with that of the mother.—This was done only in 5 cases. In all these cases the mother's corpuscles were found to be quite compatible with the infant's serum and *vice versa*.

Temperature in pregnancy anæmia.—The great majority of patients exhibit a febrile temperature, which is irregular and intermittent before confinement. Thus, out of 53 cases, only 5 exhibited an afebrile temperature, or a slight rise which could be neglected.

There was enlargement of the spleen in 6 cases only, in only one of which malarial parasites (malignant tertian rings) were found. The aldehyde test for kala-azar was negative in all these cases.

Excepting the case in which the malarial parasite was found other signs of malarial infection, such as rigor, chill and sweats, were absent. There was an exception in some cases in which rigor and a high rise of temperature followed intravenous injection of glucose, which however was controlled by itself. This irregular and intermittent febrile temperature which is present in the majority of cases suggests a chronic underlying infection. This is further

CHART I



Percentage of pregnancy anæmia cases amongst obstetric admissions for 5 years.

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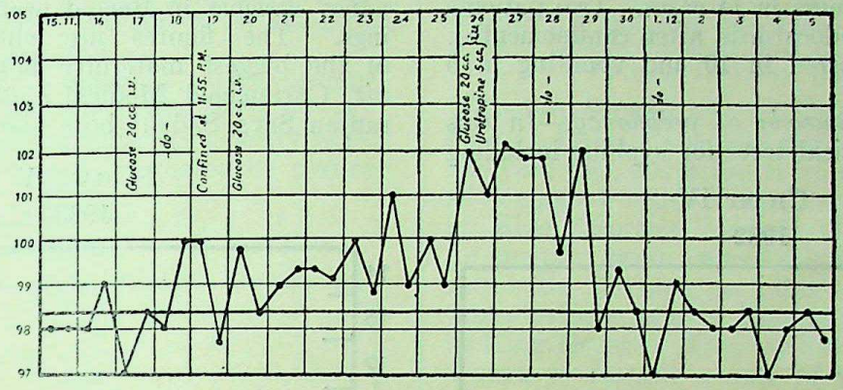
borne out by the fact that, in the majority of cases, the tendency to febrile temperature persists after confinement. In our series of 50 cases there was some rise of temperature in 45 cases, lasting more than a day.

A typical temperature chart is given.

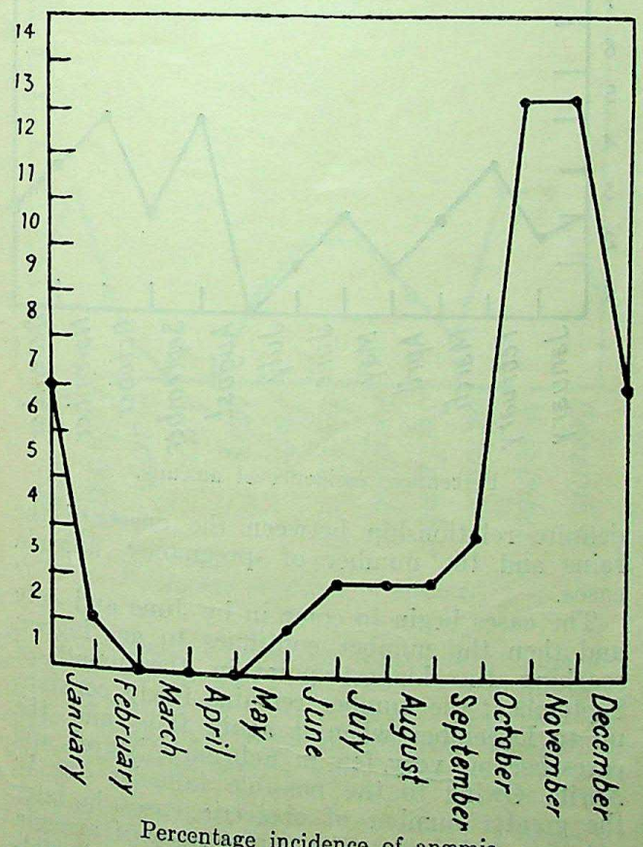
As regards the treatment of the febrile condition the temperature both before and during the puerperium can usually be controlled by glucose (20 c.cm.) intravenously every day or every alternate day either alone or along with urotropin (5 c.cm.).

Œdema.—Œdema was present in 45 out of 53 cases. General anasarca was present in as many as 20 cases, amongst which marked albuminuria was found only in two cases without, however, any casts; in the rest albumin was either absent or present only as a trace. The red blood counts of the 7 patients without œdema averaged 1.98 millions (from 3.0 to 0.89 millions), two being below one million.



Temperature chart. A typical chart in pregnancy anæmia.

CHART II
1930

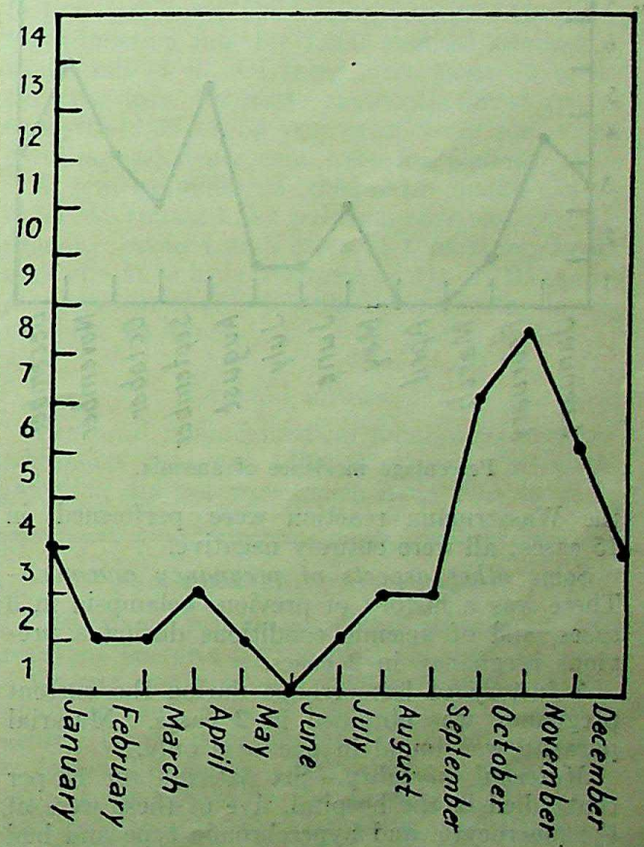


Percentage incidence of anæmia.

The fever and leucocytosis.—There was leucocytosis immediately before and during the febrile attack in the majority of cases. In a few severe cases there was an absence of leucocytosis.

The urinary output in pregnancy anæmia.—One of the associated conditions of pregnancy anæmia is the diminution in the quantity of urine. In the great majority of cases (36) this occurred, however, without any casts or albuminuria, or with albumin as a faint trace only.

CHART III
1931



Percentage incidence of anæmia.

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In 4 cases there was noticeable albumin but no casts.

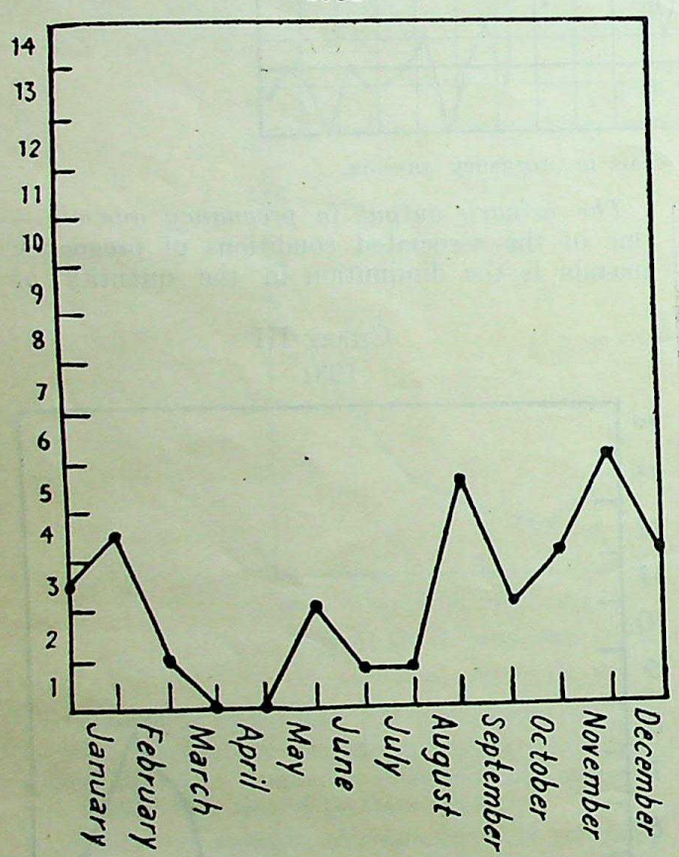
Complications.—The tendency to develop underlying sepsis has already been dwelt upon; the resulting febrile reaction has been mentioned previously, as also have the œdema, oliguria, and albuminuria. Lung complications including congestion and broncho-pneumonia occurred in 15 cases. There was cardiac distress with hæmic murmurs in 14 cases. Two patients died of acute endocarditis after confinement.

Diarrhœa occurred in 10 and vomiting in 5 cases.

Syphilis and anæmia of pregnancy.—In this series the serological tests for syphilis including

CHART IV

1932



Percentage incidence of anæmia.

the Wassermann reaction were performed in 15 cases; all were entirely negative.

Some other aspects of pregnancy anæmia.—There was a history of previous eclampsia in 3 cases, and of anæmic conditions during a previous pregnancy in 2 cases.

A history of hæmorrhage during the current pregnancy was obtained in 2 cases. Malarial parasite was found in one case only.

Maternal mortality.—Six patients (or 12 per cent) died in the hospital, five of these were of the macrocytic and hyperchromic type and had febrile reactions and other complications after confinement. All of them had severe degrees of anæmia, from 0.5 to 1.01 million red cells.

The sixth case was microcytic and normochromic and had a cell count of 1.8 millions.

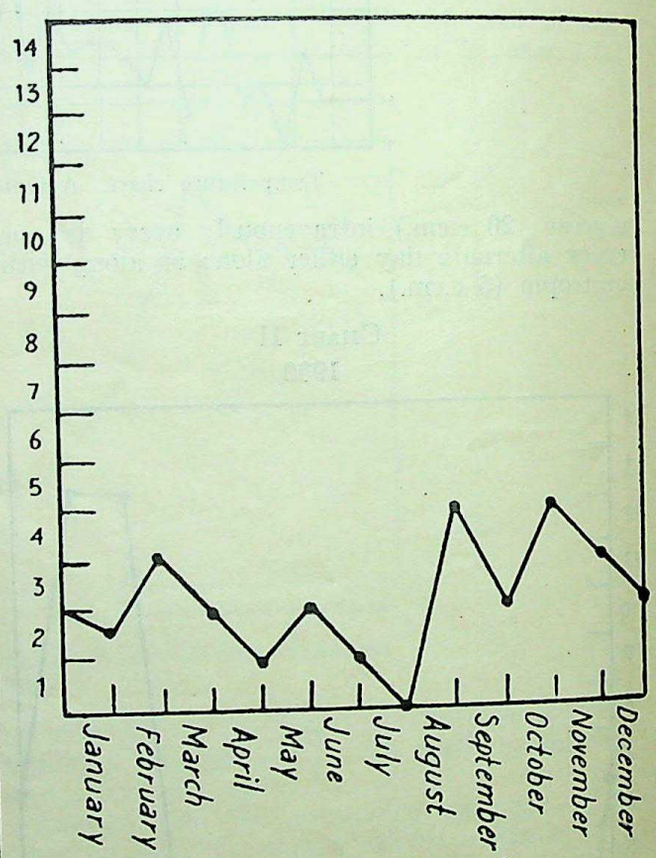
Infantile mortality.—In 14 cases (or 28 per cent), the infants died in the hospital; 3 (6 per cent) being cases of premature or macerated babies, and in 11 cases the babies died within a few days of birth.

Of the mothers giving birth to dead infants two were macrocytic and one normocytic.

The seasonal variation of pregnancy anæmia.—The study of the seasonal variation of pregnancy anæmia in Bengal presents definite findings. The figures are obtained from two of the biggest maternity hospitals in Bengal, *viz*, Carmichael Medical College and Chittaranjan Seva Sadan; both show that there is a

CHART V

1933



Percentage incidence of anæmia.

definite relationship between the onset of the rains and the number of pregnancy anæmia cases.

The cases begin to come in by June and July and then the number continues to get higher, reaching the highest point in the month of September; the number remains fairly constant up to December when it again falls and the cases become very few in February, March and April. Owing to the possible fallacies due to the greater number of obstetric cases in later months of the year, the percentages of anæmia cases in both the hospitals are given in the following charts. Chart I shows the percentage of anæmia of pregnancy cases of the total cases of pregnancy for 5 years (from 1930 to 1934), and charts II to VI show this for each of these years.

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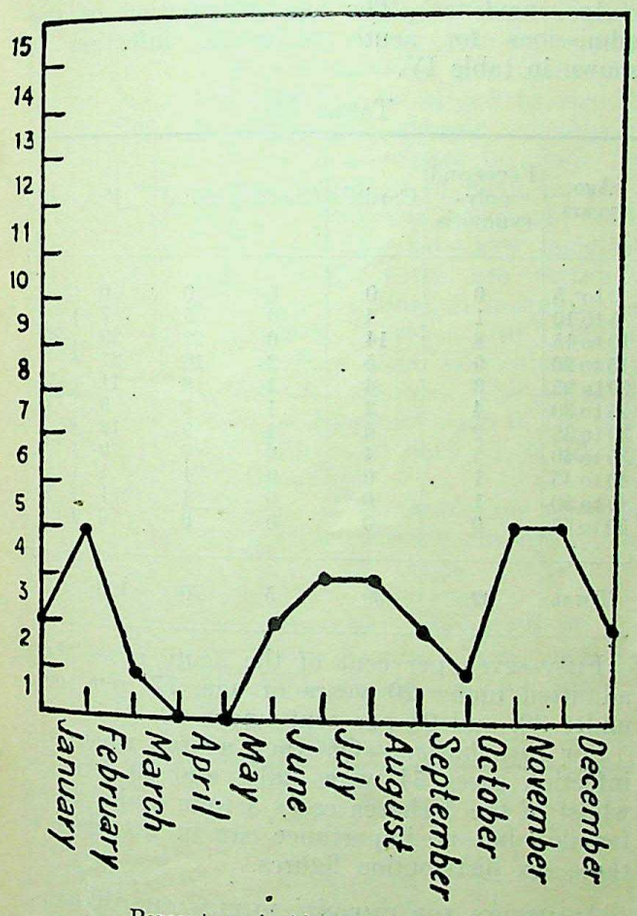
Bacteriology of the stools.—We examined the stools of 20 cases of pregnancy anæmia both by the ærobic and anærobic methods. The results may be briefly put down as follows :—

(1) No constant bacillus or coccus was obtained excepting *Bacillus coli.* The streptococci isolated from the stools of some of them were mostly non-hæmolytic. The hæmolytic streptococci were present in only 5 cases.

The strains of *B. coli* were generally of the non-hæmolytic variety except in 6 cases in which they were hæmolytic.

(2) No constant anærobic spore-forming organisms were found; the media used for primary culture was cooked meat and sheep's brain media. The organisms were isolated by plating

CHART VI
1934



Percentage incidence of anæmia.

and culturing them under anærobic conditions in the Macintosh and Field's jar. The organisms were identified by the changes observed in cooked meat, milk, and the different sugars.

The following results were obtained :—

Clostridium welchii	..	4 cases
" *histolytica*	..	1 case
" *sporogenes*	..	1 "
" *chauveii*	..	1 "
Unidentified spore-formers	..	2 cases

(Continued at foot of next column)

THE INCIDENCE OF RHEUMATIC INFECTION IN INDIA

(AS JUDGED BY THE ADMISSION AND POST-MORTEM RATES AND BY THE CLINICAL EXPERIENCE OF TEACHING PHYSICIANS AT THE MEDICAL COLLEGES AND SCHOOLS OF INDIA): PART II

By H. STOTT, M.D., F.R.C.P., D.P.H.
LIEUTENANT-COLONEL, I.M.S.
Professor of Pathology and Physician, King George's Medical College, Lucknow, and Dean of the Medical Faculty, Lucknow University

To help forward the knowledge of the distribution of rheumatic infection in India, I have analysed the incidence of rheumatic infection as compared with the total medical admissions at King George's Medical College, Lucknow, for the past seven years 1930–1936, and also the rheumatic post-mortem rates since 1914, in the tables which follow. The physicians attached to King George's Hospital have also been good enough to furnish a note of their independent opinion—without having seen the statistical results.

ADMISSIONS FOR ACUTE AND FOR SUBACUTE RHEUMATIC INFECTION

1. *Type incidence*

Of the 76 admissions for acute rheumatic infection (*see* table I) in King George's Hospital, the admission rate for 1,000 medical admissions works out at 6. Of these admissions 32 or 42 per cent were for acute rheumatic fever (polysynovitis), 39 or 52 per cent were for acute carditis, and 6 per cent were for chorea.

A few examples of rheumatic nodules were observed amongst the polysynovitis and carditis groups. Some 4 or 5 cases of typical erythema nodosum have been observed by Dr. T. Bahadur, physician in charge of skin out-patients, during the past 10 years.

Annual incidence

The total annual medical admissions and the admission rate per 1,000 for acute rheumatic infection did not vary much from year to year.

(Continued from previous column)

The above results show the absence of any constant bacteria by the methods used by us.

Gastric analyses.—In our own series gastric analyses were done in 15 cases; of these, low acidity curves were obtained only in 4 cases.

Acknowledgments.—The writer wishes to express his thanks to Professor C. C. Basu, to Lieut.-Colonel P. Fleming Gow, to Principal M. N. Bose, to the visiting physicians and surgeons of the Carmichael Medical College and Chittaranjan Seva Sadan, to Dr. S. M. Ghosh, Dr. Brajendra Mahalanobis and Mr. P. C. Chakraborty.

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TABLE I

Showing the admission rate per 1,000 medical admissions

Years	Poly-synovitis	Carditis		Chorea only	Total acute rheumatic infection	Total medical admissions	Acute rheumatic infection per 1,000 admissions
		Endo-carditis	Peri-carditis				
1930 to 1936 ..	32	25	14	5	76	13,902	6
Average per year	4.5	3.5	2	0.7	11	1,986	6

The actual figures for the successive seven years are shown in table II.

TABLE II

Showing the general medical admissions and the rheumatic infection rate

Years	General medical: total	Acute rheumatic infection per 1,000 admissions
1930	1,835	4
1931	1,981	1
1932	1,688	2
1933	2,072	11
1934	2,162	5
1935	2,154	6
1936	2,010	5

The year 1932 in Lucknow was one of phenomenal floods.

Monthly incidence.—The distribution of these acute rheumatic admissions for the seven years, according to the month of admission, is shown in table III.

TABLE III

Months	Acute rheumatic infection admissions	Climate	Average
April ..	6	Hot dry months	5
May ..	5		
June ..	4		
July ..	9	Hot damp months	6.25
August ..	6		
September	5		
October ..	5		
November	7	Cold dry months (Christmas rains).	7.2
December	6		
January ..	7		
February	7		
March ..	9		
TOTAL ..	76		

As might be expected* the lowest average monthly admissions (5) were during the hot dry months, the intermediate admissions (6) during the hot damp monsoon months, and the highest figure (7) for the cold dry months—during which there is often a break of 7 to 10 days' rain about Christmas. It is perhaps surprising that the highest figure is not recorded in the hot damp monsoon months when of course the rainfall is very heavy throughout and the chill liability high.

Age incidence.—The age distribution of the admissions for acute rheumatic infection is shown in table IV.

TABLE IV

Age, years	Fever and poly-synovitis	Carditis	Chorea	Total	Per cent	
0 to 5	0	0	0	0	0	
5 to 10	1	4	0	5	7	57
10 to 15	8	14	0	22	29	
15 to 20	9	5	2	16	21	
20 to 25	3	4	1	8	11	20
25 to 30	4	2	1	7	9	
30 to 35	2	6	1	9	12	21
35 to 40	3	4	0	7	9	
40 to 45	1	0	0	1	1	2
45 to 50	1	0	0	1	1	
50 to 55	0	0	0	0	0	
TOTAL	32	39	5	76	100	

Fifty-seven per cent of the acute cases were admitted under 20 years of age, 77 per cent under 30, and 98 per cent under 40.

Sex distribution.—Of the acute rheumatic infection cases 54 were males and 19 females, whilst of the 5 chorea cases 3 were males and 2 females, but no importance can be attached to these sex distribution figures.

ADMISSION FOR CHRONIC RHEUMATIC MITRAL DISEASE

Type incidence.—Table V shows the admission rates per 1,000 medical admissions. About one-half of the chronic mitral disease admissions were without heart failure and about one-half were with heart failure. In the former group, the valve defect was predominantly stenosis in 34 per cent, regurgitation and stenosis in 37 per cent, and regurgitation only in 19 per cent. In the heart failure group 61 per cent was for congestive failure only, 18 per cent for congestive failure with auricular fibrillation, and 21 per cent for auricular fibrillation only.

*[It is not justifiable to base any conclusions on these very slight differences in seasonal incidence.—EDITOR, *I. M. G.*]

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TABLE V

1930 to 1936	WITHOUT HEART FAILURE				WITH HEART FAILURE AND AURICULAR FIBRILLATION				Grand total	Per mille medical admissions
	Predominant stenosis	Combined S. and R.	Regurgitation only	Total	Congestive only	Congestive + A. F.	Auricular fibrillation only	Total		
Actuals ..	40	54	22	116	70	21	24	115	231	17
Per cent ..	34	37	19	..	61	18	21	..	..	..
Average per year	6	8	3	17	10	3	3	16	33	17

I am informed that in London at St. Bartholomew's Hospital, St. Thomas Hospital and the London Hospital the admissions due to rheumatic fever provide about 20 per mille of the whole admissions, but possibly a large number of rheumatic heart cases are sent to special hospitals. If the 6 admissions per mille for acute rheumatic infection be added to the 17 admissions per mille for chronic rheumatic valvular disease, and if allowance be made for the tropical diseases admitted to King George's Hospital, Lucknow (tropical diseases form about 10 per cent of the Lucknow medical admissions), the Lucknow rates are certainly comparable with those of London hospitals. I am, however, uncertain whether the London rates are calculated on medical admissions only or on the total admission figures. The per mille admission rates in Lucknow for each of the past seven years from 1930 have been 11, 6, 10, 19, 25, 27 and 14, respectively.

Monthly incidence.—The admissions of these heart failure cases from primary chronic mitral valve disease show an even distribution throughout the months of the year.

Age incidence.—The age distribution of the admissions for heart failure from primary chronic mitral valve disease is set out in table VI.

TABLE VI

Years	Heart failure cases	Per cent		
0 to 5	3	1		
5 to 10	11	5	14	63
10 to 15	18	8		
15 to 20	32	15		
20 to 25	36	17	49	
25 to 30	36	17		
30 to 35	28	13		
35 to 40	19	9	30	
40 to 45	17	8		
45 to 50	11	5	7	
50 to 55	5	2		
TOTAL	216	100		

Fourteen per cent of the heart failure cases were under 15 years of age, 63 per cent under 30, 85 per cent under 40 and 93 per cent under 45 years of age. If a comparison be made with table IV which sets out the age of onset of acute infection, it will be noted, whereas the incidence of 57 per cent of acute cases is under 20 and the main incidence (acute cases) is between 10 and 15 years of age, that 56 per cent of the chronic heart failures following therefrom are between 25 and 40 and that the main incidence falls between 20 and 30 as might be expected.

Sex distribution.—Of the 231 chronic rheumatic heart failure cases, 159 were in males and 72 in females, but again no deduction can be made from the sex distribution figures.

POST-MORTEM RATES

In September 1937 I reviewed the post-mortem records of King George's Medical College, Lucknow; out of a total of 661 post-mortem examinations since 1914, there was no case of acute rheumatic infection, but in 15 there was chronic rheumatic mitral disease, an incidence of 2.2 per cent; in ten of these cases there was congestive heart failure.

In 3 cases there was evidence of regurgitation only and in 12 the lesions were stenotic.

Previous rheumatic history.—In 12 (80 per cent) there was a history of previous rheumatism.

Sex and caste distribution.—Thirteen were males and two females. Thirteen were Hindus and two Mohammedans.

The age distribution at death.—All died between the ages of 5 and 46, and 60 per cent were between 15 and 30 years. One was between 5 and 10 years, one between 10 and 15 years, three between 15 and 20 years, three between 20 and 25 years and three between 25 and 30 years, one between 30 and 35 years, one between 35 and 40 years, and two were aged 45 years.

THE CLINICAL EXPERIENCE OF ATTACHED PHYSICIANS

The physicians attached to King George's Hospital have kindly recorded their independent opinions, which now follow—along with my own views which have already been published elsewhere. In the present state of our knowledge the experience of individual teaching physicians is probably of higher value than the statistical evidence available even from the most reliable sources.

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Major Alexander, M.B., M.R.C.P., lately Additional Professor of Medicine, Madras, and now Professor of Medicine, King George's Medical College, Lucknow, writes :

'That rheumatism has come to be regarded as a new disease in India is difficult to explain. Rheumatism and its sequelæ are commonplace both in Madras and in the United Provinces.

In Madras acute rheumatic fever with the typical arthritis and fever yielding to salicylates and at times producing carditis occurs quite frequently, while mitral stenosis is common. That mitral stenosis can be regarded as a true index of previous rheumatism few would, I think, deny. I met with no cases of subacute rheumatism while in Madras, but most of such cases do not reach the hospital in India owing to the mildness of the disease. One case of chorea was seen by me in two years.

In Lucknow, I am under the impression that rheumatic infection is even commoner than in Madras. In the medical wards of the King George's Hospital, it is rare not to find two or three cases of chronic heart damage produced by antecedent rheumatism. In the past year, there have been two cases showing typical rheumatic nodules, pericarditis and articular pains, four cases of rheumatic chorea in children, besides certain cases where subacute rheumatism has been suspected in children. It is possible to obtain suggestive histories of previous rheumatism in the majority of cases coming to hospital with mitral stenosis'.

Dr. B. N. Vyas, M.B., Physician to King George's Hospital, writes :

'During 39 years of my practice, I cannot recall more than a dozen or so typical cases of rheumatic fever in my private practice, so that the incidence of this disease can only be described as rarer in the United Provinces. The main features of the cases which I can recall from my own practice were continued and prolonged fever, polyarthritis, and acute endocarditis. On the other hand, there are a fairly large number of cases which one comes across of valvular disease of the heart among adult boys and girls which could not have been due to any other cause than rheumatic fever in some form or other. The previous history of these cases in the majority of cases is very vague though some cases do give a definite history of arthritis. Judging therefore from my personal experience, I can only come to the conclusion that rheumatic fever does occur but is not of frequent occurrence, that the clinical syndrome in the majority of these cases is not exactly of the type described in European textbooks, and also that even a very mild form of the disease can be complicated by endocarditis followed by valvular disease of the heart, particularly mitral stenosis'.

Dr. Hargovind Sahai, Out-patient Physician and Physician to King George's Hospital, writes :

'It is a false notion that rheumatic fever is rare or unknown in India, though it is a fact that most of the cases during the acute stage do not come under our observation for certain reasons applicable to the particular disease and other diseases of acute onset. On the other hand, chronic cases with heart and joint complication can be seen almost every day in medical wards, out-patients and private practice alike. In fact a larger proportion of the cases treated by us for heart failure turn out to be rheumatic in nature when the history is carefully taken. The onset of the disease can be traced to some distant date with typical symptoms of rheumatic fever, *i.e.*, fever, shivering, restlessness, pain in joints, profuse sweating, etc. The history of such relapses is also available in many of them.

Such cases are seen all throughout the year, but acute cases are most commonly met with during the months of December, January and February, especially at the time of the winter rains, and the history of exposure is available in almost all of them. The acute cases almost invariably are found in young adults and children, more in boys than in girls, which may be due to the fact that girls visit the hospital in fewer numbers than boys.

The tendency of this disease to recur in active form after a quiescent stage is noticeable in a fairly large number of them during the damp months. Polyarthritis is the commonest condition which gives a clue to the true nature of the disease and acute endocarditis is recognized later on in some cases. The mitral valve is most commonly affected.

Chorea and rheumatic nodules though not unknown are seen rarely as symptoms of rheumatic fever in this part of the country'.

Dr. Abdul Hameed, M.D., M.R.C.P., Physician, King George's Hospital, writes :

'The prevalence of rheumatic disease in this province is not uncommon. In my practice I have come across so far an average of one case of rheumatic disease every two months. These cases do not, as a rule, belong to Lucknow, but they come from distant places in the province. I have seen genuine cases of rheumatic fever with the fleeting type of polyarthritis, definitely yielding to salicylates. I have followed some of these cases, both in private practice and in the hospital practice, and seen definite heart lesions coming up in them later. In one case under me in the wards, it was followed by mitral and subsequently by aortic disease. All these cases were young men between the ages of 12 and 25 years and were unequivocal cases of rheumatic disease of the heart. I have seen, in practice, the following manifestations of rheumatic fever :—

(1) Acute rheumatic fever with polyarthritis —definitely yielding to salicylates and followed by heart lesions—several cases.

(2) Acute endocarditis—two cases.

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(3) Mitral stenosis—simple and compensated, and with various complications—numerous cases.
(4) Rheumatic nodules—two or three cases.
(5) Chorea—two or three cases.

At the present moment, I have three cases of rheumatic heart disease under my treatment in private practice.

The above account is based on observations made on Indian patients only'.

Dr. B. B. Bhatia, M.D., M.R.C.P. (Lond.), writes (11-9-1937):

'During the last thirteen years that I have been in practice, I had several occasions to work in the wards and out-patients of the King George's Hospital. During this period I have seen a large number of cases of undoubted rheumatic heart disease, mostly of the chronic valvular type, but in a few of these only could I get an antecedent history of acute rheumatic fever accompanied by polyarthritis. During the same period I have only seen 6 cases of acute rheumatic fever, 4 of chorea, and 2 of rheumatic nodules. In my opinion, rheumatic infection is not at all uncommon in these provinces, but I do feel that the clinical picture produced in Indians is different from that met with in England. Rheumatic infection seems to affect Indians in a more insidious and subacute manner; nervous manifestations (chorea) are proportionately much less compared to cardiac involvement. Similarly, rheumatic nodules are very rarely seen, and I have not seen a single instance of rheumatic pleurisy. The only history of rheumatism which I could obtain from cases of chronic valvular disease was that of having suffered in the past from vague pains and aches and occasional arthralgia'.

SUMMARY

1. The incidence of acute and chronic rheumatic infection at King George's Medical College Hospital, Lucknow, has been worked out per mille medical admissions according to the clinical type, and according to seasons, age and sex.

2. The post-mortem rate for heart failure from primary mitral valve disease at Lucknow is 2.2 per cent for 661 total post-mortem examinations; 60 per cent of these cases died between 16 and 30 years of age.

3. The clinical experience of the five teaching physicians attached to King George's Hospital is given.

APPENDIX*

Note on the juvenile type of rheumatism in Bengal

By E. H. VERE HODGE, M.D., F.R.C.P.
LIEUTENANT-COLONEL, I.M.S.
Professor of Medicine, Medical College, Calcutta

OF late years interest has been focussed on the incidence of juvenile rheumatism in India, an interest which has been further stimulated by statements in European medical journals to the effect that rheumatic infection is unknown in the tropics. Reference to current medical literature in India will reveal the fact that physicians are not only familiar with the disease but that it is prevalent and an important cause of cardiac disability. During the last six years, there were 261 admissions for juvenile rheumatism to the Medical College, Calcutta. The number of admissions is given advisedly rather than the number of cases, as it is impossible to exclude sundry readmissions from the series. The number was made up as follows :—

Acute arthritis with or without cardiac lesions	54
Chorea	4
Cardiac lesion of the rheumatic type without arthritis on admission ..	203

In a series of 48 cases of acute arthritis, 47 patients responded to salicylates and one died of acute cardiac complications.

There appear to be certain marked differences in the Indian type from the standard European. Firstly, it would appear that the age incidence is somewhat extended. In a series of cases collected over a period of five years, the age on admission was as follows :—

Under 2 years	1
From 2 to 5 years	2
From 5 to 10 years	6
From 10 to 20	26
Above 20	15

These figures naturally do not represent the exact age of onset; in many cases it is difficult or impossible to estimate this owing to the insidious invasion of the disease. My experience shows, however, that it is not exceptional to encounter patients suffering from a first attack of rheumatic fever at the age of thirty.

As regards the age incidence of cardiac lesions, the earliest case of well-marked mitral stenosis was at four years.

Nodules are of extreme rarity. I have met this condition three times and in all three was the infection of a grave type, two rapidly succumbing to heart failure.

Chorea in Indian children in Bengal is also of extreme rarity. I have seen it in one case only, outside the hospital, though four admissions have been reported within the last six years. Among Anglo-Indian children living in congested areas it is less rare, though by no means as common as other rheumatic manifestations.

Skin eruptions I have seen in one case only, an English child domiciled in Calcutta who developed a second attack of acute rheumatism at a hill school and ultimately died of heart failure after a series of anginal attacks.

The disease is not confined to the poorer classes, but seems to depend more on surroundings, being prevalent in the congested areas of large cities. Among European children in better

(Continued at foot of next page)

*This note was prepared at the suggestion of Colonel Stott and forwarded to us direct.—EDITOR, *I. M. G.*

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SHORT NOTE ON AN EPIDEMIC OF CHICKEN-POX IN THE CENTRAL JAIL, CANNANORE

By P. V. KARAMCHANDANI, M.B., B.S., F.R.C.P. (Edin.)
MAJOR, I.M.S.
Superintendent, Central Jail, Cannanore

My excuse for publishing this paper on an epidemic which is all too common is some of its significant features, which in my opinion need stressing and which are so well depicted herein, and the present-day tendency to ignore the infectious nature of this disease in adults (not only by lay authorities but also by some medical men).

The epidemic started on the 5th November, 1937. The total convict population of this jail at the time was 878. The usual period of quarantine for the new-comer is 10 days. During this period the convict receives preventive vaccine against enteric and cholera, is vaccinated, and gets Foster's bowel disinfectant treatment, as a routine. Since the first case occurred in a convict who had been in jail for 12 months, the disease was apparently imported by some intermediary. Steps were taken immediately and the whole block was completely isolated, while the patient was removed to a segregation shed outside the hospital.

Details of cases are reproduced below in tabular form :—

TABLE I

Total cases	Cases with dates	Distribution by blocks	
Batch no. 1	2 on 5-11-37	Borstal block	12
13 cases	8 on 6-11-37	Sixth block	1
Fever average	1 on 8-11-37		—
4 days.	1 on 10-11-37		13
	1 on 11-11-37		—
	—		
	13		
Then there was no case for 7 days.			
Batch no. 2	5 on 19-11-37	Borstal block	22
28 cases	4 on 20-11-37	Sixth block	5
Fever average	5 on 21-11-37	Second block	1
4.1 days.	5 on 22-11-37		—
	1 on 23-11-37		28
	3 on 24-11-37		—
	1 on 26-11-37		
	2 on 27-11-37		
	1 on 28-11-37		
	1 on 29-11-37		
	—		
	28		
Then there was no case for 5 days.			
Batch no. 3	1 on 5-12-37	Borstal block	5
7 cases	3 on 7-12-37	Sixth block	1
Fever average	2 on 9-12-37	Ninth block	1
5 days.	1 on 11-12-37		—
	—		7
	7		—
Then there was no case for 12 days.			
Batch no. 4	1 on 24-12-37	Third block	1
1 case			
Fever for 5 days			
Then there was no case for 13 days.			
Batch no. 5	1 on 7-1-38	Third block	2
2 cases	1 on 10-1-38		
Fever for 5 days each.			
Then there was no case for 15 days.			
Batch no. 6	1 on 26-1-38	Third block	1
1 case			
Fever for 1 day			

(*Continued from previous page*)

circumstances who live away from the bazaar area, it is practically unknown.

Geologically, the whole of Eastern Bengal would appear to be particularly suited to the development of arthritic disorders, as the soil is entirely alluvial and the surface water level in the rainy season approximates to that of the ground level.

The range of temperature in Calcutta together with the humidity is shown in the table at the foot of the page.

A juvenile type of rheumatoid arthritis, not common but still admitted sufficiently frequently to be regarded as a definite type, is worthy of comment. These cases resemble in some essentials acute rheumatic infection and are sometimes confused with it. There is the same high fever, severe joint pains and swelling. Further, there is a tendency to develop slight relative mitral incompetence from toxic myocarditis and a progressive anæmia. The distinction, however, lies in the following characteristics :—The pain and swelling tends to persist in the joints attacked, there is a tendency to marked affection of the joints of the hands, there is no response to salicylates, true valvular lesions do not develop and there is a more definite leucocytosis. The last case admitted of this type reacted well to Prontosil.

Monthly average of temperature and humidity at Alipore (Calcutta)

Months	Average mean temperature (in °F.)	Average maximum temperature (in °F.)	Average minimum temperature (in °F.)	Mean relative humidity (in percentage)	Mean absolute humidity (in inches of mercury)
January ..	64.8	77.3	55.5	73	0.433
February ..	69.3	82.0	60.0	69	0.481
March ..	78.5	90.9	69.3	68	0.642
April ..	84.2	95.6	75.7	71	0.808
May ..	85.8	94.5	77.5	74	0.899
June ..	84.9	91.5	78.8	81	0.966
July ..	83.6	88.4	78.6	85	0.974
August ..	83.0	87.6	78.4	86	0.969
September ..	82.6	88.0	78.0	86	0.949
October ..	79.8	87.2	74.3	82	0.825
November ..	72.0	82.0	64.3	76	0.582
December ..	64.4	77.0	56.0	72	0.422

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TABLE II

AGE INCIDENCE

Age in years	Number of cases
17	3
18	2
19	4
20	12
21	9
22	5
23	4
24	3
25	2
28	1
30	1
35	1
40	1
41	2
43	1
50	1
TOTAL ..	52

All the cases were quite severe with lesions varying between 100 to 1,000 in number and temperature ranging up to 103°F. The prevalence of smallpox in the neighbourhood raised an alarm of smallpox within the jail, but there was not even a shadow of doubt about the disease being chicken-pox.

The unmistakable signs of the chicken-pox lesion, *viz*, centripetal distribution and want of shottiness, prove true in every case of chicken-pox and never occur in smallpox. But unilocular vesicles, successive cropping of vesicles, in the absence of umblication have been observed in smallpox.

In spite of complete isolation of the infected cases and their contacts, the epidemic extended to 6 blocks and lasted for 82 days. Most of the European textbooks call chicken-pox 'an affection of middle childhood, being uncommon after 10 years'. This fact may have contributed to the strengthening of the prevalent belief which I have mentioned in the beginning of this paper, but which was clearly negative in this epidemic at least (*vide* age incidence, table II).

Finally, the periods of quiescence extending up to 15 days are a significant warning, neither to be too jubilant about the subsidence of the epidemic nor to be too hasty in revoking the measures of prophylaxis. Ten days being the limit laid down by the authorities for submission of infectious disease reports, these had to be discontinued four times and recommenced three times. On each occasion I was pressed by my staff to relax the measures of prophylaxis, but I was adamant, which action was justified by subsequent happenings.

Xylol was tried as a prophylactic measure with negative results.

I have to thank Lieutenant-Colonel S. C. Contractor, I.M.S., Inspector-General of Prisons, Madras, for kind permission to publish this paper.

A CASE OF ADRENAL INSUFFICIENCY SIMULATING THE ADAMS-STOKES' SYNDROME

By E. SELBY PHIPSON, C.I.E., D.S.O., M.D., M.R.C.P.
COLONEL, I.M.S.

Inspector-General of Civil Hospitals, Assam, lately Senior Medical Officer, Colony of Aden

THE following case seems worthy of record, not only as an example of a comparatively rare condition, but also on account of the extreme manifestations of hypotonia and bradycardia which for a time seriously threatened the patient's life, but which were followed by complete recovery within the space of a few weeks.

Mr. R. H., aged 27, was admitted to the European General Hospital, Aden, on 3rd March, 1937, having been disembarked, together with his wife and young child, from a Dutch steamer homeward bound from Java to Rotterdam. The history given by the ship's surgeon was that for two months past the patient had complained of being easily fatigued, and of giddiness and headache, chiefly in the occipital region. It appeared he had lived a very active life in the management of a large plantation in Java and was suffering from some degree of nervous strain, apparently as a result of certain heavy responsibilities which he has been called upon to undertake in the course of his work, which would have been a heavy burden for a much older man.

History of the case while on board the ship

On 22nd February, 1937, at 3-30 a.m., he suddenly became very ill and collapsed, with slight mental confusion, vomiting and a moderate degree of cyanosis. He had an irregular pulse of about 30 to 35 a minute. There was no evidence of heart block. The heart was enlarged slightly to the left. The patient rallied after an injection of camphor in oil and cardiazol and for about a week the symptoms improved and the pulse remained fairly regular at 45 to 60 a minute. During this period he was treated with a Dutch preparation called 'digalin', but the dosage could not be ascertained from the ship's surgeon's report.

On 2nd March, at 3 a.m., he had a second very severe cardiac attack with acute cardiac oppression and anxiety, cold sweat, pallor, coldness of the extremities and some right-sided facial paralysis, the pulse rate varying from 25 to 30 per minute. There was still no evidence of true heart block, but he had also considerable difficulty in articulating words. He was treated with injections of camphor in ether and camphor in oil, with hot bottles to the extremities. After this the pulse rose to 40–45, though the patient still complained of severe headache and restlessness, and by 2 p.m., he was feeling

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slightly better, but his condition continued to give rise to grave anxiety until he reached Aden.

History of the case after disembarkation

On 3rd March, 1937, in response to a wireless message, I visited him on board ship on her arrival at Aden and after I had discussed the case with the surgeon and with the patient's wife, he was disembarked and removed to the European General Hospital, Aden, where he came under my care. On examination I found that he looked acutely ill and his pulse rate on admission was 48, and his blood pressure was systolic, scarcely 60 mm., and diastolic, 40 mm., of mercury. There was evidence of slight cardiac dilatation to the extent of about half an inch but the heart sounds were free from any indication of valvular disease, though they were much weaker than normal. The period of the diastolic pause was greatly increased. There was no difference in the auricular and ventricular impulse rates and there was therefore no evidence of heart block, although the symptoms had borne more than a superficial resemblance to the Adams-Stokes' syndrome, nor of myocarditis, nor, indeed, of any gross cardiac lesion, though there was some reason to believe from the patient's history that at one time the cardiac function had been impaired, possibly as a result of rheumatic infection in childhood. The conditions which the heart presented were broadly those of bradycardia (which had been extreme, according to the ship's surgeon's report) and a dangerous and sustained fall in blood pressure.

The pathological origin of these two symptoms was somewhat obscure. I had been able, after discussion with the ship's surgeon, to exclude obvious toxic causes, and, although the ship's surgeon had, as he stated, treated the patient for about a week with 'digalin' (presumably a preparation of digitalis), this form of medication certainly did not give rise to the bradycardia, as the bradycardia had preceded the digitalis medication, though it may possibly have accentuated it afterwards. I considered the low pulse rate and the low blood pressure were likely to be due less to toxic causes or to a primary cardiac condition than to some remote condition acting on the heart as a secondary manifestation of some other disease. A condition which is well recognized as a sequela of acute specific fevers and occasionally met with in tropical countries after lesser febrile complaints, malarial and otherwise, and particularly after dengue fever, and which involves temporary impairment of the adrenal function, appeared to be the underlying cause of his symptoms. The sudden development of very acute symptoms on board, following a prolonged period of what had no doubt been a state of lowered vasomotor tone, suggested a hæmorrhage into the substance of the adrenal bodies already damaged by toxic or other influences.

Progress while in hospital

This tentative view was somewhat strengthened by the patient's remarkable response to subcutaneous injections of adrenalin. The effect of this line of treatment was very striking; after 4 four-hourly injections of min. 5 of adrenalin (Parke, Davis and Co., 1:1,000) his pulse rate rose from 45 to 80 and his blood pressure from 60/40 to 110/70. This form of treatment was then experimentally suspended for 58 hours, during which time his pulse rate again dropped to between 50 and 60 and his blood pressure dropped to 90/65. This appeared to me to indicate that the adrenalin medication was doing good and that, on its temporary withdrawal, the want of it was felt. It was accordingly started again on 6th March, in somewhat smaller dosage (min. 5, *b.i.d.*). This was continued for 48 hours, when it was found that his blood pressure had risen to 130/70 and his objective symptoms and all discomfort had completely disappeared.

About this time the patient's father, mother and father-in-law who, on learning by wireless from the ship of the apparently desperate condition of the patient, had chartered a K. L. M. air liner, arrived by air from Holland, and his father suggested that, if I agreed, they would like to take him back with them to Holland by air. I replied, after careful consideration, that his progress in hospital had been so good that if he was prepared to employ the services of a doctor or a trained nurse on the voyage to continue the treatment, and was prepared to provide the patient with a supply of oxygen and a Haldane's oxygen apparatus (which I had previously ascertained, through the courtesy of my colleague, Group-Captain E. W. Craig, R.A.F.M.S., Principal Medical Officer, Aden Command, could be made available) and provided that the pilot was able and willing to limit his maximum flying altitude to 10,000 feet, I thought that the voyage could be undertaken without undue risk. It was not found possible to obtain the services of a doctor, but a lady resident in Aden, a fully-trained (London Hospital) nurse, who, before her marriage, had been on the staff at the European General Hospital, Aden, agreed to travel by air to Holland in charge of the patient. The patient's father willingly agreed to all the conditions I considered necessary to impose. In the consideration of the precautionary measures necessary I naturally sought, and was guided by, the advice of Group-Captain Craig, whose wide experience of the actual problems involved was of the greatest value, and I gratefully acknowledge his willing and courteous help.

The patient's departure by air

The K. L. M. air liner, which had been chartered by the patient's father, left Aden at daybreak on 9th March, with the patient, his wife and child, the party from Holland, and the

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trained nurse. The nurse had received instructions from me to continue the adrenalin medication in doses of min. 4, subcutaneously, twice a day, to administer oxygen with the Haldane's apparatus if there should be any signs of respiratory or cardiac distress, and, if necessary, to use coramine as a further cardiac and respiratory stimulant. I thought it unlikely that oxygen would actually be required, but it was plainly necessary to provide for such a contingency in transporting a patient 4,000 miles by air who had but recently suffered from severe and almost fatal cardiac crises.

The captain of the air liner, Captain Smyrnoff, had agreed to keep his flying altitude as low as possible having regard to the comfort of the passengers, and if necessary to land at the nearest air-port and abandon the idea of further transport by air, and to limit the maximum altitude to 10,000 feet. He had also made advance arrangements by cable to pick up further supplies of oxygen *en route* if necessary. I learnt later that the air liner travelled at an average altitude of 3,000 feet, and only occasionally rose to 5,000 feet. This, I believe, could only have been done by a highly-skilled pilot.

The air liner reached Cairo the same evening, Rome the following evening and reached her destination in Holland soon after 1 p.m. the next day, 11th March, with all well on board.

The nurse's report, which she sent me later, indicated that there was never any indication for the administration of oxygen or stimulants and that everything went according to plan, except that four hours after leaving Aden on arrival over Port Sudan, the hypodermic syringe was found to be broken and the injection due at 10 a.m. could not be given. This was significant, as the patient apparently felt the loss of it for, by the evening, shortly before arriving at Cairo, he felt unduly fatigued and complained of double vision, due, no doubt, to unequal loss of tone in the ocular muscles. As soon as a new syringe had been obtained and he had had his injection, however, these symptoms left him, and after a light dinner he retired early and slept well all night. The following evening, at Rome, he was able to sit up and take his evening meal in comfort in the hotel with his family, and the next day, soon after 1 p.m., he arrived at Flushing none the worse for the 4,000-mile journey, which, as far as the annals of Aden are concerned, was unique.

Discussion

I had not had the patient under observation long enough, nor sufficient resources at my disposal, to arrive at other than a tentative diagnosis. I had previously advised the patient's father to have his son examined by a cardiologist of repute in Amsterdam, to confirm my view that the condition of the heart itself was not the primary cause of the patient's alarming symptoms, and that the true ætiological factor was probably adrenal insufficiency, temporary in character, the sequela, no doubt, of some febrile complaint contracted in Java, which, in itself, may have been of but slight importance.

The patient, soon after his return to Holland, was accordingly examined by his family doctor, Dr. L. H. J. Brongers of Meddelburg, and was then seen in consultation by Dr. de Haas, an Amsterdam consultant. The patient's father was good enough to send me the reports of these two doctors, who had seen my report on the case and who, at the time of the examination, were satisfied that there was no cardiac lesion of any kind, and that the patient was in a perfectly sound state of health, and that the condition must have been 'an acute vasomotor paralysis with secondary cardiac phenomena'. With the re-establishment of the normal vasomotor tone, which coincided with, and may have been determined by, the patient's return to temperate climate, all symptoms and signs completely disappeared.

The true ætiology of the condition presented by this case, which could not unfortunately be fully studied and which, after recovery, left apparently no traces of any morbid change, must be largely a matter of surmise. Although adrenal insufficiency appeared to be the most probable cause, there are other conditions which might have accounted for the train of symptoms described. The group of maladies, for example, which includes vasovagal syncope, the carotid sinus mechanism, and the syndromes of Gowers and of Nothnagel all resemble in certain respects the condition described, but these, judging from the only account at present accessible to me, by Sir Thomas Lewis (1932) (kindly placed at my disposal by Professor F. R. Fraser of the British Post-Graduate Medical School), are all described as being of a transient nature in the sense that their manifestations cover a period measurable in minutes, and not of many days as in the case reported.

Although the necessary clinical observations were wanting on board the ship there can be little doubt that the marked hypotension, which was observed as soon as the case was admitted to hospital, had been present throughout the attack which began on 22nd February, and which lasted, on and off, for over a week, and that therefore the underlying cause at least was capable of sustained, though possibly irregular, action. This is more suggestive of depressed activity of the adrenal medulla than of any of the conditions related to vasovagal syncope, though the co-existence of bradycardia with the hypotonia certainly suggests parasympathetic stimulation.

My excuse for recording these somewhat meagre observations must be the concluding sentences of Sir Thomas Lewis's paper referred to: '. . . . Our understanding of the transient derangements of the circulation must depend on

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A STUDY OF THE DIETARY HABITS OF SOME COMMUNITIES LIVING AT CALCUTTA

By DURGA DAS MITRA, M.B., M.SC., D.P.H.

(From the Department of Biochemistry and Nutrition, All-India Institute of Hygiene and Public Health, Calcutta)

THE object of this investigation was to ascertain the dietary habits of different communities on a qualitative rather than a quantitative basis. The technique employed was to find out the average number of times a particular foodstuff was consumed each day in a group of individuals. For instance, suppose in a group of ten, each member takes rice once a day, the index for rice would be $\frac{10}{10} = 1$. Similarly, if only five of them took rice twice a day, the index would again be $1\left(\frac{5\times2}{10}\right)$. In practice it is simpler to limit the number of foodstuffs to include similar ones under a group, *e.g.*, carrots and potatoes under non-leafy vegetables, and meat and fish under animal foods. Milk and milk products on account of their importance should be considered alone. The method consists in giving each member a card on which he or she writes down exactly what is consumed at each meal in the day. Greater accuracy can of course be obtained if the average of several days is taken. Obviously the highest index, *i.e.*, the maximum number of times a given food is consumed in a day, is unlikely to exceed three while the minimum may be *nil* or a small fraction. The investigator himself can arrange the foodstuffs into any suitable set after inspection of cards.

The method can be relatively easily applied to a school where the master can give the children full instructions as to filling in the cards. A number of foods may be marked on the cards before issue, but it is probably better to let the subjects write down exactly what they consumed, as in this way unsuspected comestibles may be discovered by the investigator. In the actual process of calculating the results, a large sheet may be prepared with the selected types of foods written up. Each card is then taken and one or more marks put opposite the item concerned. All the cards having been dealt with, the marks are summed for each group and the index obtained by dividing this figure by the number of cards.

Below is an example of how the diet cards should be filled in and it will be appreciated that the method is within the reach of an intelligent school child.

The investigation discussed here included four different communities, namely, Bengali Hindus, Moslems, Marwaris, and Anglo-Indians, and all the children belonged to a relatively well-to-do class, in the economic scale. The Moslems included both Bengali and up-country Mohammedans, but the latter were in the majority, though many of them were domiciled in Calcutta. In the analysis the comestibles were all grouped under nine heads, *viz*, rice, bread, pulses, vegetables, fruits, milk and milk products, fish, eggs and meat.

A few points in the analysis of these diet sheets deserve special mention. Both the Bengali Hindus and the Marwaris often record green vegetables (*sag*) as one of the usual items of their diet while they are seldom mentioned by the Mohammedans and the Anglo-Indian communities. The Anglo-Indians seem to favour jams and jellies while the Marwaris are fond of *chutnies* and condiments. The Marwaris are vegetarians, and consume no fish, flesh, or eggs.

The Marwaris usually take hand-made bread of *atta* and *papar* (made of pounded gram); the Anglo-Indians take white loaves while the Bengali Hindus often mention *luchis* which are made of white flour. In only eight out of one hundred and sixty Bengali diet sheets has brown bread been specifically mentioned.

The Mohammedans and the Anglo-Indians take pulses, vegetables and dairy products less often than the Bengali Hindus and the Marwaris. They also consume meat more often than the Bengali Hindus who however take rather more often fish and eggs. The Mohammedans take fruits and nuts less often than the other groups.

The meat mentioned in the Anglo-Indian diet sheets is most varied, *e.g.*, beef, mutton, bacon, fowl, duck, etc. In the Mohammedan diet sheets are mentioned beef, fowl and mutton, while in the Bengali Hindu diet sheets are mentioned only goat meat and sometimes mutton and rarely fowl.

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our directly ascertaining whether the blood pressure rises or falls, and what happens to the pulse rate. Yet these, more often than not, are just the data that are not available, and so knowledge of vasomotor seizures in man remains more obscure than it should remain'.

The attendant circumstances in this case have been reported in rather more detail than is perhaps usual, in the hope that they may prove of interest to practitioners abroad who may have, from time to time, to consider the propriety of air transport of patients from tropical countries to the United Kingdom. On the main air routes this mode of transport is, no doubt, already fairly frequently made use of, but it is perhaps of value to place on record the particulars of the successful transport, 4,000 miles by air, by 3 stages in 2¼ days, of a case which, at first sight, appeared to be a highly unsatisfactory subject for air transport.

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School—X. Y. Z.
Initials of the student (full name not necessary)—P. L.
Age—7 years 8 months. Denomination—A.-I.
Sex—Male.

TABLE I

Morning breakfast of to-day	Morning meal of to-day	Night meal of previous day	Afternoon refreshments of previous day (after school)	Midday tiffin of previous day
Nil	Cold beef and bread, tea, porridge, milk, and bananas.	Soup (bone), beef roast, potatoes, and baked custard pudding.	Bananas, bread and tea	Rice, dâl, meat curry with potatoes, custard apple and guava.

Extras between meals: sweets, chocolates, biscuits.

The following table shows the dietary habits of the respective communities in reference to the main articles of diet only :—

Several points should be noted in this survey, keeping in mind that the subjects were not of the poorer class. The Marwaris, who are vegetarians, do not consume milk products more frequently than the Bengali Hindus who take fish, mutton or goat. The Anglo-Indian community also have a low index (0.7) for milk and milk products and their cereals consist of rice (1.4) and white bread (2.8). This community would appear to have a diet which is poor in calcium, phosphorus, and vitamins of the B group. In this respect the Marwaris are somewhat better off, as they take wheat as *atta* rather than bread made of white flour.

TABLE II

Showing the daily indices for the common articles of food of the different communities

COMMUNITIES	BENGALI HINDUS		MARWARIS		ALL HINDUS (INCLUDING BENGALI HINDUS AND MARWARIS)		MOHAMMEDANS		ANGLO-INDIANS	
Number of children questioned	160		100		260		200		100	
Comestibles	Number	Daily indices	Number	Daily indices	Number	Daily indices	Number	Daily indices	Number	Daily indices
1. Rice ..	254	1.6	94	0.9	348	1.3	259	1.3	140	1.4
2. Bread ..	278	1.7	224	2.2	502	1.9	383	1.9	277	2.8
3. Pulses ..	246	1.5	138	1.4	384	1.5	158	0.8	99	1.0
4. Vegetables ..	386	2.4	191	1.9	577	2.2	115	0.6	94	0.9
5. Fruits and nuts.	102	0.6	42	0.4	144	0.5	63	0.3	66	0.7
6. Milk and milk preparations.	303	1.8	106	1.1	409	1.6	146	0.7	70	0.7
7. Fish ..	220	1.4	0	0.0	220	0.8	64	0.3	14	0.1
8. Eggs ..	39	0.2 } 1.7	0	0.0	39	0.1 } 1.1	20	0.1 } 1.7	51	0.5 } 1.9
9. Meat ..	20	0.1	0	0.0	20	0.1	265	1.3	128	1.3

The Anglo-Indians have the maximum index for bread, *viz*, 2.8; next come the Marwaris, 2.2; while the Bengali Hindus have the maximum index for rice, *viz*, 1.6.

In considering animal proteins, milk and milk preparations are considered separately because the small quantity of milk that is taken by grown-up boys in an average home can hardly be considered side by side with the more concentrated protein foods, *e.g.*, fish, eggs or meat, to which singly and as a group reference will be made in this paper.

The Anglo-Indians have the highest index for animal protein, *viz*, 1.9. Wilson *et al.* (1936) have also found that the total animal protein intake (29.95 grammes) per 'man value' amongst the Anglo-Indians is high in comparison to that of an average Bengali Hindu family and others.

Conclusion

In this paper an attempt has been made to find out the number of times some common articles of food were consumed per boy per day. This has been studied in four communities, *viz*, Bengali Hindus, Marwaris, Mohammedans and Anglo-Indians, and shows their different habits and customs. The boys in general belong to the relatively better-off classes of their respec-

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THE GUINEA-PIG IN THE LABORATORY DIAGNOSIS OF TUBERCULOSIS

By R. K. GOYAL, M.B., Ph.D., D.Sc., M.R.C.P., M.R.C.S., F.R.S.E.

From the Bacteriological Department, School of Tropical Medicine, Calcutta

THE discovery of the susceptibility of the guinea-pig to mammalian tuberculosis was a landmark in the history of research. Although the latest cultural methods for the isolation of tubercle bacilli are very efficacious, yet the guinea-pig cannot be dispensed with in a laboratory engaged on tuberculosis research.

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tive communities. The comparison has been made in terms of the 'daily index' which has been taken as the ratio of the number of times a particular item of food is consumed each day to the number of children consuming it.

Nine comestibles have been studied, *viz*, (*i*) rice, (*ii*) bread, (*iii*) pulses, (*iv*) vegetables, (*v*) fruits and nuts, (*vi*) milk and milk preparations, (*vii*) fish, (*viii*) eggs, and (*ix*) meat.

Some of the maximum indices are as follows:

Rice 1.6 (Bengali Hindus); bread 2.8 (Anglo-Indians); pulses 1.5 (Bengali Hindus); vegetables 2.4 (Bengali Hindus); fish 1.4 (Bengali Hindus); meat 1.3 (Mohammedans and Anglo-Indians).

It appears among other points that the Mohammedans and the Anglo-Indians take the pulses and vegetables less often, and meat, fish and eggs, taken together, more often than the Hindus for the reason that the Marwaris are vegetarians.

The Marwaris do not appear to compensate for their vegetarian habits by a greater frequency of consumption of milk.

The Anglo-Indians consume a diet which is poor in calcium, phosphorus and vitamins of the B group because of their taking polished rice and white flour as cereal foods.

It should be pointed out, however, that such a survey as this gives no quantitative information. A low index may mean that a particular food is consumed say only once a day but in large quantities. In general however the index does probably show the dietary trend of a community or social class.

I wish to acknowledge the help received in this inquiry from Dr. H. Ellis C. Wilson, M.B., Ch.B., D.Sc., Professor of Biochemistry and Nutrition, and to express thanks to Dr. R. B. Lal, M.B., B.S., D.P.H., D.T.M. & H., D.B., Officiating Director, All-India Institute of Hygiene and Public Health, for his kind permission for publication.

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The extreme rarity of spontaneous mammalian tuberculosis in this animal led workers to believe that other strains of tubercle bacilli could not exist in a saprophytic state. Whenever suspected material was inoculated, the bacilli isolated were always considered to have been derived from the inoculum. This mistake has been and is still the cause of many fallacious conclusions.

The study of bacterial variation in the mycobacterium has given at best debatable results. Dissociation can be effected *in vivo* as well as *in vitro*. Birkhaug (1935) made an exhaustive study of the dissociation of tubercle bacilli. He had recourse to the ingenious method of Ninni in his work. Ninni (1930) had found that the best way of infecting a guinea-pig was by inoculation into its cervical lymphatic glands. Birkhaug injected his cultures into this site and was able to recover rough and smooth strains from the blood, although he had injected only rough strains. It was taken for granted that the smooth strains thus obtained had come from the injected material and not from the guinea-pig.

The serological studies of Schaefer (1935) showed clearly that the so-called smooth variants of rough mammalian bacilli belonged to the avian group. It is inconceivable that a mammalian strain could give rise to a variant of the avian group. At this stage, Saenz and his collaborators (1936) came to the conclusion that a certain number of guinea-pigs harboured a new type of tubercle bacillus. They considered it to be different from avian strains because of its feeble pathogenicity and its production of an acid reaction when grown in Sauton's medium. This contention received support from the serological studies of Schaefer (1937). He found that this bacillus differed from the typical avian bacilli in its antigenic constitution. But Goyal (1936) found that the new type of bacillus could not be differentiated from the avian on the basis of the reaction produced in the liquid media. The change in the reaction of the medium depended not only on the particular strain under examination but also on the physical conditions operating at the time, *e.g.*, the proportion between the quantity of the bacilli and the fluid medium, the shape of the container, and the presence or absence of a surface layer. These findings were accepted by Saenz and his collaborators. The low virulence was not considered to be of especial significance, as a virulent avian strain could become non-pathogenic under unfavourable conditions. Schaefer decided later that the new type of bacillus should be classified as an avian strain.

It can be safely concluded that a certain number of apparently normal guinea-pigs harbour tubercle bacilli of the avian group.

In view of this work, it would be unscientific to consider every organism isolated from an inoculated guinea-pig as having been derived

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THE SPECIFIC GRAVITY OF SERUM OF EPIDEMIC DROPSY PATIENTS

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S. LAL,
and
K. S. MALIK

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MOORE and VAN SLYKE (1930) have shown that when there is a fall of the plasma albumin below 2.5 per cent or of the total plasma protein below 5.5 per cent œdema occurs. These authors state that the serum specific gravity that corresponds to these limits of plasma protein content is 1.0227 to 1.0233. Chopra, Mukherjee, and Gupta (1935) studied the plasma protein of epidemic dropsy patients and recorded low protein values for albumin and increase in the globulin fractions.

The present investigation was undertaken to determine the specific gravity of the serum of patients suffering from epidemic dropsy. Sera from twelve in-patients suffering from epidemic dropsy and sera from six healthy individuals were used for this work. All the patients had well-marked œdema when the first samples of serum were taken. A second sample of serum was examined in 10 patients when the œdema had entirely disappeared. The blood was collected in the morning before any heavy meal was taken by the patient. In all cases the serum obtained was clear. A pyknometer of about 1 c.cm. capacity was used for the determination of the specific gravity of the serum. The estimations were made in a cool room and necessary corrections made for variations of temperature. The results are given in tabular form.

TABLE

Showing the specific gravity of the serum of patients suffering from epidemic dropsy and the specific gravity of the serum of six healthy individuals

Number.	Serum taken when the patients had well-marked œdema	Serum taken when the œdema had entirely disappeared	Serum taken from healthy individuals
1	1.0229	1.0249	1. 1.0258
2	1.0231	1.0248	2. 1.0275
3	1.0220	1.0269	3. 1.0258
4	1.0202	1.0247	4. 1.0263
5	1.0235	1.0270	5. 1.0265
6	1.0209	1.0261	6. 1.0256
7	1.0229	1.0268	..
8	1.0216	1.0255	..
9	1.0223	1.0264	..
10	1.0235	1.0269	..
11	1.0229	1.0246	..
12	1.0140	Died.	..

It will be seen that the specific gravity of the serum of healthy individuals ranges between 1.0256 to 1.0275 with a mean value of 1.0263. The specific gravity of the serum of epidemic dropsy patients with œdema varies from 1.0140 to 1.0235 with a mean value of 1.0223. The specific gravity of 1.0140 was obtained in a patient who was very ill and at the time of examination had marked œdema. This patient died ten days later. This figure has been excluded from the determination of the mean value. When the œdema disappears the specific gravity of the serum tends to approach that of the normal serum, varying in the patients examined from 1.0246 to 1.0270 with a mean value of 1.0259.

It will be seen from these observations that the specific gravity of the serum of patients

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from the inoculum. Some workers would say that, if the guinea-pigs were tested with the Mantoux's test before inoculation, then there would be no difficulty, because the negative-reactors could safely be used. But the work of Saenz *et al.* has shown that this argument is fallacious. Guinea-pigs may react negatively to tuberculin at the time of the injection of a non-pathogenic inoculum, but become allergic later on. A guinea-pig giving a positive tuberculin test may not present any macroscopic lesions on autopsy; the films from the glands and spleen may not show the presence of acid-fast bacilli, but the culture of the spleen would reveal the presence of acid-fast bacilli of the avian group.

The presence of avian bacilli in the guinea-pig is rare so that if two guinea-pigs injected simultaneously with the material under examination show the presence of avian bacilli, their presence in the inoculum can be safely concluded.

The non-recognition of the presence of avian bacilli in the guinea-pig led to the postulation of the theory of the filterable form of tubercle bacillus. When the Chamberland filtrate of tubercle bacilli was injected into guinea-pigs and acid-fast bacilli occasionally found in the lymph glands, certain workers (Valtis, 1924) jumped to the conclusion that the bacilli must have come from the filtrate; they might have been present in the animals before injection.

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A METHOD OF ANTI-LARVAL OILING FOR RIVERS

By D. MANSON, M.B., Ch.B., L.D.S. (Glas.)

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Introduction.—During the monsoon in Assam, the rainfall is characterized by spells of heavy downpour followed by intervals, short or long, of hot, dry weather. The result of this irregularly distributed rainfall is that the permanent rivers and streams sometimes flow slowly and sluggishly, and at other times, after heavy rains, are converted into wide, deep, rapidly-flowing channels loaded with silt and debris.

The velocity of these streams and rivers therefore varies considerably. In a previous article, the writer has detailed experiments dealing with these velocities. It was found that velocities exceeding 2.04 miles per hour were sufficient to wash out the larval stages of *Anopheles minimus* which is the principal, almost the only, vector of human malaria in Assam. Similar results were obtained by De Jesus in the Philippines. Where, however, there are diverticula or culs-de-sac in the river banks, and in intervals between heavy rainfalls when the velocity of the rivers and streams falls below two miles per hour, larvæ of *A. minimus* are abundantly found. During the months of December, January and February, larval breeding proceeds very slowly and larval wintering occurs. There are no periods of flush and semi-stagnation such as are characteristic of the monsoon. In the monsoon, flushing is succeeded by spells of low river velocity and at the beginning of these intervals fresh batches of *A. minimus* larvæ infiltrate from areas where no anti-larval control methods are in operation.

In anti-larval control areas, therefore, the regular oiling of river banks is a necessity during the monsoon months, when transmission of malaria is constant and where large bodies of labourers are employed as on tea gardens. Oiling is carried on during these spells between heavy rains when the river velocities permit the presence of *A. minimus* larvæ, and larval infiltration has occurred.

But even such velocities as two miles per hour render efficient oiling difficult. The old methods of drip oilers and ordinary spraying of river banks are not only relatively ineffective but extremely wasteful.

In this area, Jorhat-Titabar-Mariani, anti-larval control has been in operation since 1931.

Old method of oiling.—Until last year, the method of oiling moving water was as follows:—

When *A. minimus* larvæ were found along a section of the river bank, that area was enclosed with bamboos placed so as to isolate the breeding ground. Two short bamboos about 3 feet

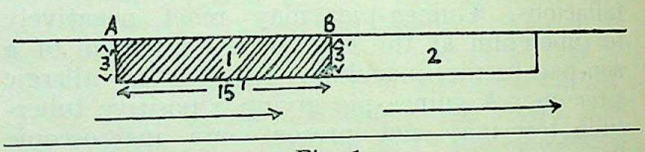

Fig. 1.

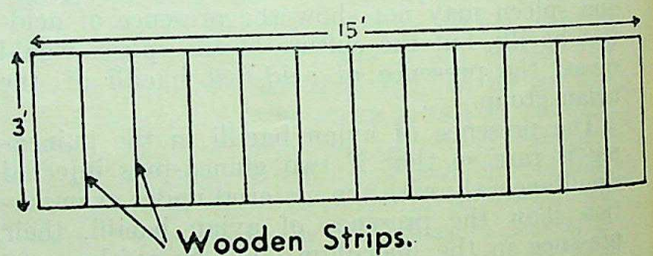

Fig. 2.

long were placed at each end of the area at right angles to the river bank. One end of each short bamboo rested on the bank and the free ends were joined by a bamboo about 12 or 13 feet long so as to form an oblong enclosure. The diagram (figure 1) shows this clearly.

The diagram shows a section of river with a shaded *A. minimus* breeding area enclosed by bamboos. The arrows indicate the direction of flow. A second bamboo enclosure is marked 2 and is unshaded.

Oil was sprayed inside the bamboo enclosure and after an interval of 15 to 20 minutes (sufficient to allow for larval extermination when using Malariol) the lower end short bamboo marked B in the diagram was removed and the oil allowed to run into a similar enclosure in the direction of river flow. This method was effective but somewhat cumbrous and wasteful.

In order to economize still further in oil expenditure and to make the application easier

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(*Continued from previous page*)

with œdema corresponds closely to the limits suggested by Moore and Van Slyke. Œdema is present when the specific gravity is 1.0235 or lower, and when the œdema disappears the specific gravity approaches the specific gravity of the control series of healthy individuals.

The specific gravity of samples of clear œdema fluid obtained by the insertion of needles was found to be 1.0047 in the four patients examined.

Summary

The specific gravity of the serum of twelve epidemic dropsy patients are recorded. During the stage when œdema is present the specific gravity is 1.0235 or lower and when the œdema disappears the specific gravity of the serum rises to approach the specific gravity of serum of healthy individuals.

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for the anti-larval gang, the method now employed is as follows :—

New method.—A length of coarse gunny with as wide a mesh as possible is selected. A piece 3 feet broad by about 15 to 20 feet long is about the regulation size used here.

To the upper side of this are attached, with rough string, strips of wood or bamboo. These are placed at intervals of 2 or 3 inches and extend across the gunny. The result forms what might be compared to a rough *chick*.

The diagram (figure 2) explains the idea clearly.

The wooden strips need not be too heavy, the lighter the better, as their sole object is to support the gunny on the water.

When completed, the gunny mat well-oiled with Malariol is now ready for use. It is rolled up and carried to the river bank. In using it, it is unrolled quickly over the larval breeding area. One long edge rests on the bank and the other is free. The top end of the mat is fastened to the river bank and, after the usual interval of 15 to 20 minutes, the mat is rolled up and used again as often as necessary.

Oil is thus easily conserved in the meshes of the gunny and one oiling is sufficient to allow the mat to be used on three or four areas without replenishment. Very little oil is washed away by the action of the water in the river, as it is well retained in the gunny.

The mat is much more convenient to handle than the bamboo and one man should easily carry it round. It can be applied very quickly over the breeding areas and the amount of oil used is not more than one-half of that required by the older method of bamboo enclosure and one-quarter of that needed for drip oiling.

This method has been used during the past year with much success on all local rivers and streams where ordinary methods of oiling have formerly been wasteful and only partially successful.

Summary.—An economical and efficient method of oiling flowing water in rivers and streams in Assam has been described. The gunny mat method is cheap and the amount of oil used is considerably reduced.

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A Mirror of Hospital Practice

APHASIA AND COMPLETE RIGHT HEMIPLEGIA AFTER SCORPION BITE

By S. H. MODY, M.R.C.S. (Eng.), L.R.C.P. (Lond.), D.T.M. & H. (Lond.), M.B., B.S. (Bom.)
Poona

A BOY, aged 11 years, was bitten by a scorpion on the 19th October, 1937, when playing in the field. The scorpion was killed by his father who was near by. On the 23rd October, five days after the bite, he felt giddy and fell down, and it was found that he was unable to walk and speak, for which condition he was admitted into the Sassoon Hospital on the 4th November.

The father is definite in the history that the boy was unable to speak for the past week and unable to move the right upper and lower limbs. He also states that when drinking any fluid, it is seen to trickle out again from the right side of his mouth.

Physical examination reveals it to be a case of aphasia, with a supra-nuclear right facial paralysis and right hemiplegia. Sensations present and intact. On the right side movements and power extremely diminished in both the upper and lower limbs. Knee jerk and ankle jerk exaggerated; plantar reflex of the extensor type (Babinski); superficial abdominal and cremasteric reflexes absent.

There is no doubt that this condition has followed upon the bite of the scorpion. There is no valvular lesion in the heart and, although difficult to explain, it must be attributed to the effect of the scorpion venom. Scorpion venom is said to resemble closely snake venom in action. Chopra, in his *Handbook of Tropical Therapeutics*, mentions that scorpion venom 'produces coagulation of blood, hæmorrhages due to injury to the capillary walls and leads to the formation of emboli due to the agglutination of the red blood corpuscles'. Amongst other effects he goes on to state, 'the nervous system becomes highly irritable, reflexes are increased, there might be a locomotor paralysis, nystagmus and even blindness'.

USE OF PROSEPTASINE IN CELLULITIS OF THE ARM

By MOHAN LAL PATHAK, M.B., B.S.
In charge, Sub-Jail and Police Hospitals, Dharamsala, District Kangra

P. S., male, aged 18 years, a college student, presented himself in the Police Hospital with complaint of fever and swelling of right arm and forearm on 2nd September, 1937.

History.—Two days previously the patient had travelled a distance of about 12 miles in a hilly tract on foot, carrying a load on his back and supporting it by his bent right arm. After reaching his destination he had noticed slight swelling of the right arm and forearm. The swelling and stiffness gradually increased and the night before coming to the hospital he got fever with a slight rigor.

On examination there was nothing remarkable about the appearance of the patient. The lower half of the right arm and upper third of right forearm were

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swollen, hot and tender to touch. Elbow joint seemed to be normal though movements were restricted and painful.

Treatment.—The swollen area was painted with ichthyol belladonna glycerine and the patient was advised rest and fomentations. But the swelling increased and the patient got fever with definite rigors and sweats at night. The same treatment was continued with the addition of intramuscular injection of 10 c.cm. polyvalent antistreptococcal serum.

This did not result in any improvement. If anything the condition became worse. Patient was naturally becoming anxious and every day fever and insomnia were telling on his general health. The swelling was homogeneous and not soft or pointing anywhere. A blood film showed polymorphonuclear leucocytosis. He was given five tablets of proseptasine (P-benzylaminobenzenesulphonamide). Next day the swelling was reduced by half and the patient felt much better. Another five tablets completed his recovery.

Probably the cellulitis was streptococcal in nature, but as the swelling neither discharged nor was opened, it is impossible to be sure on this point.

Summary.—A case of cellulitis of the right arm and forearm is described. It was cured with proseptasine (M. & B.). It is impossible to generalize from one case but the marvellous response to proseptasine suggests the value of this drug or other preparations of sulphonilamide in cellulitis and allied conditions.

SPINAL TUMOUR AND ITS DIAGNOSIS

By M. G. KINI, M.C., M.B., M.ch. (Orth.), F.R.C.S.E.
Surgeon

and

P. KESAVASWAMY
Radiologist
King George Hospital, Vizagapatam (S. India)

IN India all types of nervous disease exist, but very few spinal tumours are reported. This does not mean that the incidence of spinal tumours in this country is a rare phenomenon. The diagnosis of a spinal tumour is made by the clinical symptoms of (1) the root cycle usually unilateral; (2) the Brown-Séquard syndrome; (3) the compression paraplegia, and by special clinical tests such as lumbar puncture with biochemical test of the cerebro-spinal fluid, and by special types of lumbar puncture such as Quickenstedt's and Ayer's and cisterna puncture with the injection of lipiodol and radiography to localize the tumour.

A male, aged 35 years, was admitted in 1934 with a history of pain in the left side of the abdomen and inability to walk, 20 days prior to his admission to hospital. He gave no history of injury. In the beginning, for four months the pain was on the left side of the abdomen and of a stabbing nature, increased on sneezing or coughing and on bending forwards or sideways. The pain increased at night on lying down on his back and so he had to sit up in bed which gave him relief. Six months after the onset of the pain, he noticed tingling and numbness, first in the lower left extremity and ten days later in the right lower extremity. Gradually his left limb became weak with ultimate loss of power; subsequently he found his right limb was affected in the same way. Twenty days prior to his admission he found both his limbs paralysed. He had no loss of control over his urination or defæcation.

He was admitted with complete paralysis of all the muscles governing the ankle, foot, knee and hip of both the lower limbs. Epicritic and protopathic sensation was lost in both lower extremities up to the joint midway between the umbilicus and the symphysis pubis.

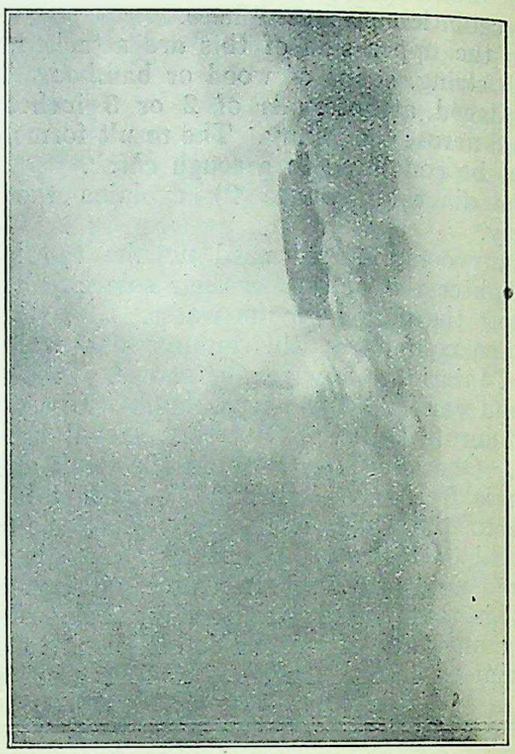

Fig. 1.—Showing the spinal block after lipiodol injection.

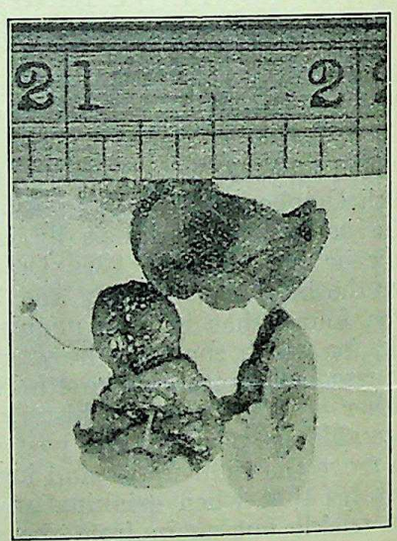

Fig. 2.—The photograph to scale showing the size of the tumour.

All the deep reflexes of the lower extremities were exaggerated; joint sense lost up to knee.

Lumbar puncture fluid showed spontaneous coagulation with 350 mg. per cent of total proteins, increased globulin and a cell count of 4 per c.mm. A cisterna puncture was done injecting 2 c.cm. of lipiodol which was found held up at the level of the 9th thoracic vertebra on radiographic examination, as shown in figure 1.

Under local anæsthesia nerve block, supplemented with general anæsthesia, the 6th, 7th and 8th laminæ

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were removed and a tumour situated in the postero-lateral aspect of the cord on the left side was easily removed and the wound sutured in layers.

The patient made an uneventful recovery. He recovered all sensations both epicritic and protopathic in about 40 days and when he was discharged from the hospital he was able to walk with the aid of crutches. Three years after the operation, he reported that he was able to resume his work as a farmer three months after the operation and is keeping perfectly fit.

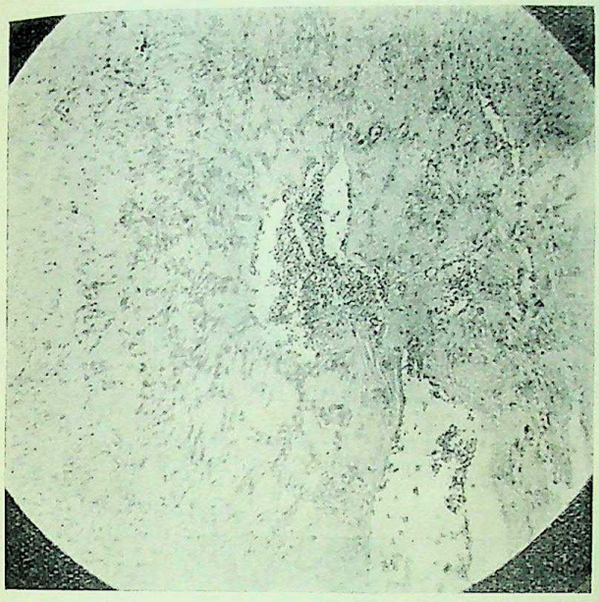

Fig. 3.—Photomicrograph of the specimen. The section shows several large engorged thin-walled vessels, typical rosette-like arrangement of elongated oval nuclei round faintly-fibrillated faintly-staining areas. The histological structure is that of a neoplasm derived from the cells of the sheath of Schwann.

This case illustrates the root cycle syndrome with the compression paraplegia of both the limbs. The Brown-Séquard syndrome stage must have passed before admission to hospital. There was a positive Froin's syndrome. The anæsthesia affected both the limbs equally. The pathological report showed the tumour to be a meningioma.

A CASE OF STAPHYLOCOCCAL POLYARTHRITIS

By M. S. H. MODY, M.B., B.S. (Bom.), M.R.C.S. (Eng.) L.R.C.P., D.T.M. & H. (Lond.)

Poona

STAPHYLOCOCCAL pyæmic infections are as a rule suppurative. The following case is of interest as it points to the possibility of a non-suppurative inflammation of the joints.

B., a Parsi aged 35, resident of Bombay, suddenly became ill on 22nd August, 1937, with a high temperature and severe pain in all the joints, in Poona, when on a week-end visit. There is nothing of interest in his family history, and his personal history is not of any moment. He had, however, been a subject of severe acne and had still some comedones on his face, with one or two of them in the state of suppuration. While in England many years ago, he had been given injections of an autogenous acne vaccine.

When I examined him, I found that he had a temperature of 102°F. and on inquiry I learned that it was not ushered in with a rigor.

While all the joints were painful, only the knees, elbows and wrists were badly involved, the others allowing free movement though to some extent painful.

All the systems were examined and found normal. I made a provisional diagnosis of rheumatic fever and I prescribed sodium salicylate, 90 to 100 grains *per diem*, for a period of twelve days, without any benefit. Owing to signs of intolerance, the dose was reduced to 30 grains *per diem*. This altered daily dose of 30 grains was kept on for a week, after which the drug was completely stopped, as the patient showed no improvement.

The temperature, however, continued between 100° and 103°F. with a pulse rate varying between 88 to 120 per minute. During this treatment 'Rheumatic Phylacogen' (P. D. & Co.) was injected for ten days and also three injections of 'Leucotropin' were given intravenously, without the slightest influence on the fever or the joint pains.

By 8th September, 1937, the patient was definitely worse. The elbow and wrist joints were greatly swollen and tender and did not allow of the slightest movement. Many types of embrocation were tried locally for the joint troubles and fomentations of turpentine, saturated sodium bicarbonate and magnesium sulphate were also exhibited, without any benefit or the slightest relief. Temperature now began to rise to 104° and 105°F., repeated rigors supervened followed by drenching perspiration, necessitating frequent changes of clothing.

I then began to suspect a septic infection and I sent several blood films and a sample of urine collected aseptically to the pathologist of the Sassoon Hospitals, Poona. Dr. Noronha, whilst reporting the absence of malarial parasites, stated that there was marked leucocytosis with a polymorphonuclear count of 80 per cent. The urine was reported to contain *Staphylococcus albus*, which it was suggested might possibly be a contamination. On receipt of this report I tried Prontosil, giving four injections between 11th and 16th September without any effect. Prostatic massage was done and the fluid thus obtained was also examined by Dr. Noronha and was reported negative to gonococcal infection.

As the patient was not improving nor responding to any line of treatment, I injected 0.05 c.cm. of 'Staphylococcus Toxoid' (P. D. & Co.) on 20th September. This injection was given in view of the urine report and the clinical symptoms, namely fever, rigors and sweats, which made me suspect that the organism isolated from the urine might not be a contamination.

I decided on a hæmo-culture which was also done by Dr. Noronha who reported an abundant growth of *Staphylococcus albus* from the blood culture. I therefore persisted with the injections of 'Staphylococcus Toxoid' already commenced; the first injection of this toxoid gave a definite reaction as evidenced by a high rise of temperature. After the second injection on the 24th there was a noticeable improvement in the temperature, which touched normal and showed an evening rise to 100°F. only, and was also accompanied by an improvement in the joint trouble. A series of ten injections of 'Staphylococcus Toxoid' were given till 6th November, in addition to treatment to raise the general body tone and to combat the anæmia present.

At the end of this period, although the temperature showed a slight evening swing upwards, all the joints had cleared completely except the right wrist and the left elbow for which he received short-wave diathermy treatment.

The only link that was omitted in the establishment of the causative factor was the

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examination of the fluid in the joints. I did not like the risk of a joint puncture for obvious reasons. It seems, however, that this does not affect the conclusion that I have arrived at, that the trouble was really due to the staphylococcus.

My view is that the primary source of the infection was acne, from which he was suffering. The previous course of the auto-vaccine that the patient received in England was probably responsible for the low virulence that the organism exhibited. One would have really expected a suppurative metastasis in the joint, in a staphylococcal septicæmia. Another point worthy of note is that the joints alone were involved and there were no other metastases elsewhere.

A PEDICLED AND PENDULOUS LIPOMA OF THE PERINÆUM*

By A. R. D'ABREU, F.Z.S., L.M.S.S.A. (Lond.)
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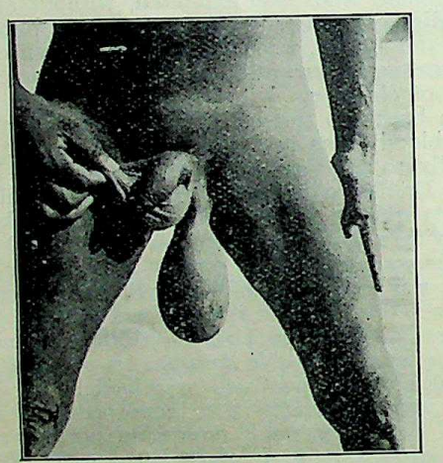
A MAN, aged 40 years, an inmate of the Hissar District Jail, had a pendulous tumour arising from the perinæum behind the scrotum, which had been there for two years. The skin was freely movable over the surface and the consistence was that of a fatty tumour though



somewhat hard. As the tumour had begun to increase in size and weight to the inconvenience of its possessor, he consented to have it removed. The specimen was sent for examination to the bacteriologist to the Punjab Government, Lahore, who reported it to consist of adipose tissue with fibrous septa.

A CASE OF CHOPART'S AMPUTATION AFTER 15 YEARS

By M. G. KINI, M.C., M.B., M.Ch. (Orth.), F.R.C.S.E.
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and
P. KESAVASWAMY
Radiologist

CHOPART'S amputation is not advocated in modern textbooks of surgery. It gives a very good end-bearing stump if properly done and the following case illustrates this point :—

A female, aged 25 years, destitute, was admitted in 1935 for a swelling on the forehead. In her childhood at the age of 10 years, she sustained a railway accident as a result of which her right foot was crushed and was amputated.

On admission she was found to have venereal warts of the vulva, the Wassermann reaction was strongly positive and the swelling of the forehead was hard and bony, but just above the glabella it was soft and slightly fluctuating.

Fig. 1.—The clinical picture of the Chopart's stump.

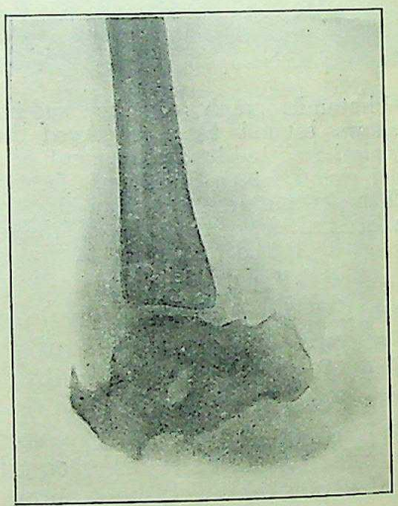

Fig. 2.—The *x*-ray picture of the ankle joint and the Chopart's stump.

There was no pulsation or increase of size on coughing and the cranial nerves were normal.

The right foot is a perfect end-bearing stump. She had been walking without the aid of any appliance. Ankle movements were very good. Right calf muscle when compared with the normal side was not so well developed but all the muscles governing the ankle joint were functioning well. She was treated for her specific condition with great reduction in the size of the swelling on the forehead and disappearance of warts but the chief interest lay in the fact that this Chopart's stump had functioned well without any extraneous appliance.

* Abridged by the Editor.

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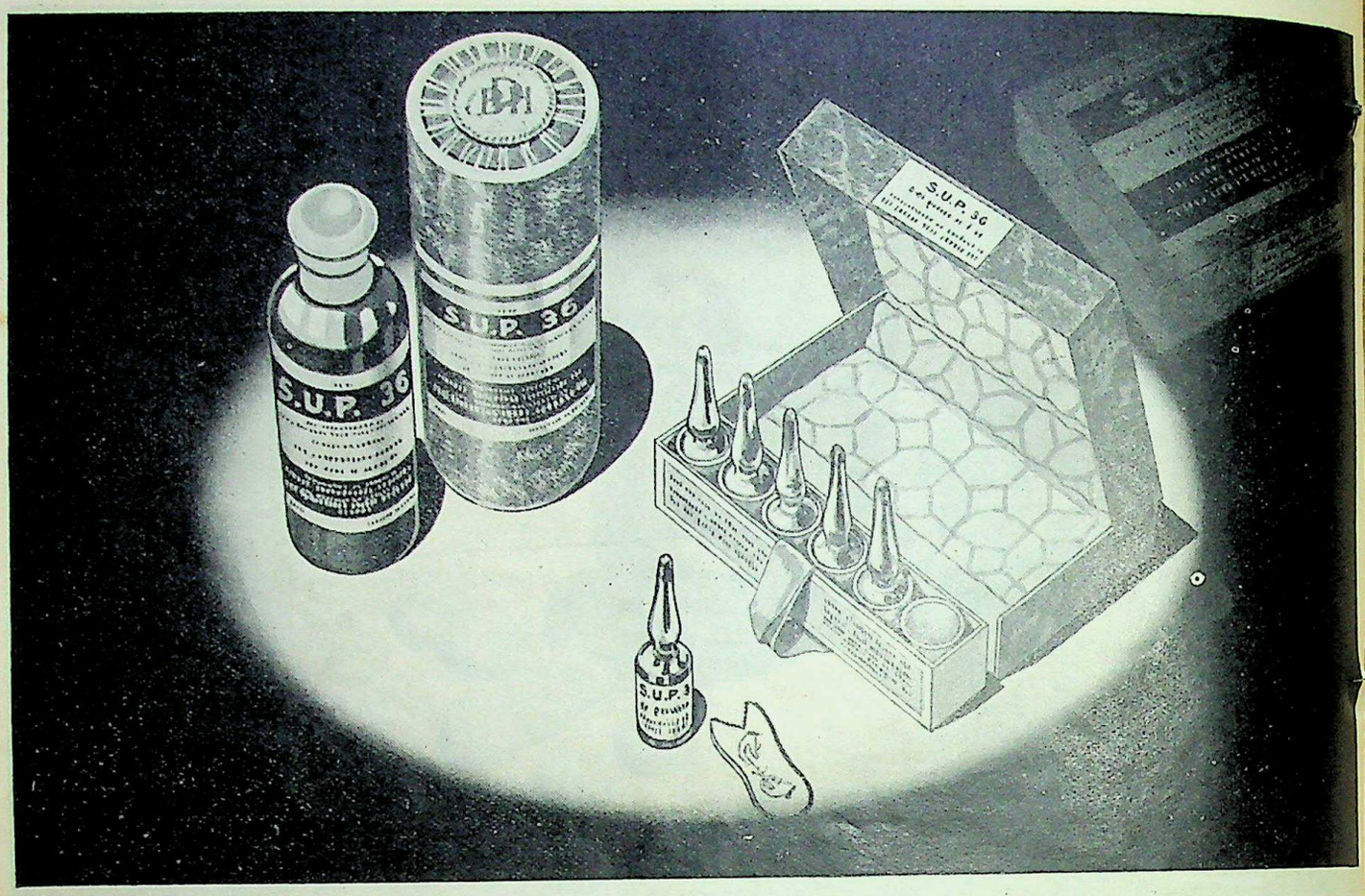

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Clinical evidence extending over a period of more than twelve years confirms the original reports of the value of S.U.P. 36 in the treatment of acute inflammatory conditions. One well-known physician reported recently that an obstinate case of pneumonia running a temperature between 103° and 104° yielded to treatment with S.U.P. 36, the temperature subsiding after one injection and falling to normal on the next day. The patient made an uneventful recovery.

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Indian Medical Gazette

MAY

LEPTOSPIROSIS

A SEVERE type of jaundice that appeared in epidemic form was described by Adolf Weil of Weisbaden in 1886, and from this time for some years there was a tendency to refer to all cases of severe jaundice that appeared in epidemic form as Weil's disease. In 1915 some Japanese investigators associated a slender coiled organism with a severe febrile attack, usually accompanied by jaundice, that occurred in both epidemic and sporadic form in Japan; this organism they recovered from the blood and urine of patients during life, and from the liver and kidneys post mortem.

In 1916 Uhlenhuth and other German workers found a similar organism associated with a form of infectious jaundice that occurred amongst the troops in the great war—especially amongst those in, or recently returned from, the trenches —and which had a comparatively high mortality (13 per cent). These organisms, now recognized as identical, are usually known by the name *Leptospira icterohæmorrhagiæ*, but the original German name *Spirochæta icterogenes* is still current.

Other clinical types of disease, which differ from the classical Weil's disease mainly in their severity, have been traced to infection with a leptospira that is morphologically indistinguishable, but serologically distinct, from the organism found in the classical disease; the word leptospirosis (λεπτος = slender: σπειρα = coil) has been applied to this disease group of which at least three types in human beings and others in animals are known, and probably many more are yet to be described.

It has been shown that all epidemics of jaundice are not due to a leptospira and the question has been raised whether the disease originally described by Weil was a true leptospirosis. This purely academic discussion, which, like the Shakespeare-Bacon controversy, can never be finally settled, is quite unimportant; the word leptospirosis can be used as the generic name of the group of diseases and Weil's name can still be honoured by its association with the particular clinical syndrome that approximates closely to his original description.

Leptospirosis has a very wide geographical distribution. The largest number of cases have been reported from Japan but perhaps this is only because physicians and research workers in that country have studied the disease more thoroughly. Considerable attention has been attracted to the disease in England recently and the cases described there now run into many hundreds. Another European country where it is particularly prevalent is Holland. In the east, outside Japan, it has been known for some years in North Queensland, Java, Sumatra, Malaya, the Andaman Islands and Burma, and it seemed only to be a matter of time before it would be recognized in India. A number of clinically-suggestive cases were reported but it was only last year that for the first time the leptospira was recovered from a human case; this was a severe case of jaundice admitted to the hospital of the Calcutta School of Tropical Medicine (reported in our October number) and since this date Dr. B. M. Das Gupta has made a definite laboratory diagnosis of leptospirosis in four other patients. All these cases appear to have been sporadic, and there does not seem to have been any common factor in the nature of their occupations, types of residence, or even habits.

It is interesting that although for some years workers in India have been looking for cases of Weil's disease and although many of us are quite familiar with both the clinical picture and the technique for demonstrating the parasite, when eventually one case was identified, four more should be found immediately; the incident demonstrates the stimulating value of success. There is no suggestion that the disease has been imported recently or that any special circumstance has led to an increase in incidence. As long ago as 1932, Knowles and Das Gupta demonstrated the infection in Calcutta rats, though the infection rate (1 per cent) in these rodents was not as high as in other places (*e.g.*, 40 per cent in Japan, 7 to 40 per cent in Holland, and 30 to 36 per cent in England); it would be interesting to see if recently there has been any increase in the infection rate amongst rats in Calcutta.

The most important improvement in the laboratory technique for the diagnosis of leptospirosis has been in the agglutination reaction and it is probably this that has led to the great advance in our knowledge of the epidemiology of the disease in recent years. Whenever a few cases have been discovered amongst a community or group of workers, it can nearly always be shown serologically that many others besides those showing symptoms have been infected; of these, some on being questioned will remember having had some fever with or without jaundice that may well have been a mild attack of the disease, whereas others will deny having had any illness. Thus, serological methods of recognizing the mild and sub-clinical infections have given us a much better idea of the incidence of leptospirosis amongst different communities and have demonstrated very clearly that it is an occupational disease.

Further, it has been shown that there are a large number of different serological strains and that to some extent the various strains have their own specific geographical distribution; that

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is to say, there are eastern strains that are seldom encountered in Europe and *vice versa*, but curiously enough the first strain encountered in India was a European strain. Up to the present it has been shown that the organisms isolated from the Calcutta cases belong to at least two different strains.

The only epidemiological observation in the medical textbooks of a quarter of a century ago was that Weil's disease was common amongst young butchers. In western countries, slaughter-house workers still seem particularly liable to be attacked; the disease has appeared in epidemic form amongst miners, and is very prevalent amongst sewer workers and canal workers; it has occurred also amongst women engaged in cleaning fish and amongst others who prepare tripe. The sporadic cases have been mainly amongst people who have bathed in canals, or who have fallen or jumped into canals or docks and have swallowed or taken into their lungs large quantities of water. In Japan it has been reported mostly amongst miners, but in the Andamans it was found mainly amongst field workers, and in North Queensland amongst sugar-cane cutters.

In the epidemiology of the disease there appears to be one common factor, the rat, and in 95 per cent at least of the epidemic or even of the sporadic cases it is impossible to exclude the rat as a possible source of the infection. It would of course be hard to exclude this ubiquitous rodent as a *possible* source of infection in any disease, but the rat is so prominent a feature in all the surroundings in which the disease is acquired—in the trenches, in coal mines, in canals, in sewers, in slaughterhouses, and in the fields amongst certain crops—that it is impossible to ignore it, even without the further evidence that the leptospira can usually be isolated from the kidneys of a certain percentage of the wild rats caught in any locality where the disease occurs; it is almost certain therefore that this rodent is the most important reservoir of infection, even if it is not the only one: there is evidence that the dog, which is susceptible to infection by a species of leptospira, *Leptospira canicola*, has been the source of infection in a few cases.

Of the epidemiology of the disease in India we know nothing; as we have said above, there appears to be no common epidemiological factor in the history of the cases so far diagnosed, and though the rat as a source of infection could not be excluded there was certainly no particular reason to suspect that the infection originated directly or indirectly from rats.

In the rat the commonest site of infection is the kidney and the leptospira is present in large numbers in the urine. The mode of its entry into man is not certain; skin abrasions are considered to be the most likely route in the majority of cases, but in the cases of accidental immersion the micro-organism probably enters *via* the respiratory tract, and in one water-borne epidemic the gastro-intestinal tract could not be ruled out. The disease has been contracted in the laboratory, where the entry may have been through the conjunctiva from a finger contaminated with guinea-pig's urine.

The incubation period is from 4 to 12 days and the onset is usually sudden, with fever mounting rapidly to reach 102°F. or 103°F. on the fourth day, continuing as a high remittent fever for a few days and then falling by lysis, the whole attack lasting about 10 days. The pulse is rapid at first but often slows down when the jaundice appears. Other symptoms are headache, stiffness of the neck, photophobia, redness of the eyes, pains in the muscles and joints, vomiting and severe prostration. Jaundice appears on the fourth day or later, but it is by no means a constant symptom, actually occurring in less than half the clinical cases. The tongue is thickly coated and there is usually obstinate constipation, though onset with diarrhœa is reported; there is a heavy cloud of albumin in the urine. Epistaxis and bleeding from the gums are common and hæmorrhages from other mucous surfaces may occur.

There is a polymorphonuclear leucocytosis and a progressive anæmia: the van den Bergh is biphasic and may reach 60 units of bilirubin. Rashes are not constant; a petechial rash may appear from the third to the fifth day, and a morbilliform rash from the fifth to the twelfth day: in very severe cases the rash is hæmorrhagic. The liver is usually palpable and the spleen occasionally; the former is nearly always tender.

The attacks vary very considerably in intensity and from serological evidence it is clear that the infection may be sub-clinical. The attacks in which there is no jaundice are never fatal, but epidemics in which the death rate was as high as 50 per cent have been reported. In its severest form the disease is difficult to distinguish from yellow fever, as was demonstrated in the classical instance when Noguchi discovered the leptospira in patients who had been shown to him as cases of yellow fever, and for a brief space of time, until the mistake was discovered, *Leptospira icteroides* was proclaimed as the causative organism of yellow fever.

The leptospira can be recovered from the blood during the first few days only, according to earlier reports, but recent evidence suggests that they are present up to the ninth day at least. Direct visualization with dark-ground illumination has been described, but is very difficult, and culture in Fletcher's medium or inoculation into young guinea-pigs is far more certain: 2 to 3 c.cm. of blood is inoculated into the peritoneum of two or three animals, as occasionally they prove refractory to infection.

From the tenth day onwards, especially between the fifteenth and twenty-fifth days, the leptospira may appear intermittently in the urine, but they are only recoverable in about

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one-third of the cases. Direct examination is again unsatisfactory as the organism may be morphologically atypical: cultural methods are difficult on account of the probability of contamination and guinea-pig inoculation is the most certain method: a few cubic centimetres of a centrifugalized deposit of urine taken aseptically are inoculated intra-peritoneally, and the guinea-pig usually dies with a fulminating infection by the tenth day, but from the fifth or sixth day the leptospira can be found in the peritoneal fluid, later in the blood and in the urine, after death the liver is the site where they can be best demonstrated.

Of the serological method, agglutination with live or formalized cultures is the most satisfactory. The titre is only 1 in 20 at the end of the first week, but rises rapidly and may be 1 in 1,000 at the end of the second and finally as high as 1 in 50,000. A high titre persists even for years in some cases. In the urine agglutinins of a titre up to 1 in 250 are sometimes present. Whenever possible a number of different strains should be used in the agglutination test and these should include examples of both 'eastern' and 'western' strains of *Lepto. icterohæmorrhagiæ* and also *Lepto. canicola.*

Our original intention in introducing this subject was to draw attention to the recent confirmation of the existence that had long been suspected of leptospirosis in this country, and we have added a few notes on the clinical picture and the diagnosis for those of our readers who were not familiar with these details. This finding of not simply one sporadic case, or even of a localized outbreak, but of five separate cases from different parts of Calcutta suggests a widespread existence in India. Many will not have the laboratory facilities to confirm the diagnosis; to these the workers at the Calcutta School of Tropical Medicine will be pleased to give all possible assistance. If they are not too ill, and it is otherwise possible, the patients themselves should be sent, otherwise 5 to 7 cubic centimetres of blood should be collected, after the first week of illness, in a sterile ampoule and sent for serological tests to the protozoology department of the School.

Special Article

DIET AND THE INCIDENCE OF DISEASE IN INDIA*

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Deficiency diseases

MODERN workers engaged in the study of the relations of faulty food to disease are emphatic in their view that food is of paramount importance in the causation of disease. In India we encounter deficiency diseases of almost every kind, *viz*, xerophthalmia, night-blindness, phrynoderma, beri-beri, nutritional œdema, lathyrism, anæmia, scurvy, rickets, osteomalacia, pellagra, vesical calculus, goitre, angular stomatitis and certain skin diseases. In the northern parts of India, including the rural areas around Delhi, diseases associated with calcium and vitamin-D deficiency, *e.g.*, rickets and osteomalacia, are met with, but these are comparatively less common in other parts of India. Urinary calculus occurs, for the most part, in the north of India and is relatively rare in the south, and its distribution seems to be related to the distribution of cereal crops, particularly wheat. According to McCarrison (1932), apart from infection and foreign bodies in the urinary tract, deficiency of vitamin A and deficiency of phosphates relative to the amount of lime in the diet are the most important contributory factors in its production. Dental caries is widespread amongst Indians whose diets are composed mainly of cereals and are deficient in fat-soluble vitamins and vitamin C; it is more common in the northern area. Deficiency of calcium and phosphorus is also widespread. Even the Northern India diet, which according to McCarrison is the best in India, has been recently found by Mullick and Irving (1937) to be inferior to the standard diet of the Rowett Institute, Aberdeen, in respect to its calcium and phosphorus content. Rice which forms the staple diet of the majority of the population in India is poor in calcium and so are the drinking water and the vegetables. Thus, diseases associated with calcium deficiency are very common in India, and particularly in Bengal.

One of the causes of hypochromic microcytic anæmia common in infants and adult women during the child-bearing period is a diet poor in iron-containing foods. The normal hæmatological standard in the Bengali women is below the normal for European women.

Lathyrism and night-blindness are common in Bihar, in the Central Provinces and in the United Provinces, whereas nutritional œdema, xerophthalmia, beri-beri, pellagra, angular stomatitis, phrynoderma and certain other skin diseases are more commonly met with in Southern India and Ceylon. Goitre is prevalent in certain zones of Northern India below the great Himalayan range, where the iodine content of the soil and food materials is low, although the latter may not be the only factor concerned in its causation.

*Read at the meeting of the Public Health Society, Calcutta, held on the 21st December, 1937.

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Diseases associated with suboptimal conditions of nutrition

McCarrison, who has a vast experience of these conditions in India, thinks that, besides the above-mentioned clearly-defined deficiency diseases, there are many maladies which are not usually regarded as of malnutritional origin, but according to the experience both in the laboratory and in the field these should be considered either wholly or in part of this nature, *viz*, gastro-intestinal diseases of various kinds including non-specific colitis and peptic ulcers, certain respiratory diseases often found in association with xerophthalmia, urinary calculus, some ulcers and cardiac disorders, pyorrhœa, and a number of others. These are perhaps due more to the faulty, unbalanced, and unvaried diets than to an actual gross deficiency. Nevertheless, they all ultimately lead to a state of malnutrition which is perhaps one of the important factors in causing the severe degree of maternal and child mortality and morbidity in India and is probably partly responsible for the state of lowered resistance to infection exhibited by so many of the Indian people. It may also, to a certain extent, account for the high mortality from malaria, kala-azar, cholera, dysentery, leprosy, tuberculosis, pregnancy anæmia, etc. In other words, as the soil is of greater importance than the seed, it is necessary to render it inhospitable to the growth of the seeds of these diseases by adequate nourishment of the body.

It is now generally recognized that much subnormal health and development, and even the incidence of disease are associated with a partial deficiency of one or more accessory food substances (M. R. C. Report, 1932). 'A race or community may be found in equilibrium with an environment which includes its food supply; and too often it is forgotten that while an equilibrium has been reached such a people may nevertheless be functioning at levels far below those possible to its innate capacities' (Hopkins, 1931). Fletcher (1932) also emphasized the presence in human beings of suboptimal conditions of nutrition which, without revealing any specific symptoms, yet weaken the resistance to infection or exposure and prevent the full efficiency and attainment which would have been possible with a food supply such as the newer knowledge of nutrition teaches. The experimental evidence of the above statements has been supplied by Sherman and others (MacLeod, 1935) in their investigation on animals.

Mann's experiments (1926) have shown that on a diet medically adjudged to be sufficient for healthy development boys were, in fact, not attaining to the physical and mental growth of which they had the potentiality and to which they did attain when given an extra daily ration of milk. Recently, Aykroyd and Krishnan (1937*b*) have obtained similar result, in their experiments with skimmed milk in some South Indian schools. It seems that similar conditions also exist in most of the Indian races whose diets, though not as grossly deficient as the South Indian or Bengali diets, are no doubt below the optimal.

It is, however, rare that the food of human beings is totally devoid of any one vitamin, mineral, or proximate principle; it is more usual for the deficiency to be partial or of the borderline type and for more than one vitamin or principle to be at fault. It is more usual still, here in India, for partial deficiency of vitamins to be associated with deficiency of suitable protein and inorganic salts and with an excessive richness of food in carbohydrates. Consequently, the manifestations of disease resulting from the faulty food are due to the combined effect of the several degrees of *avitaminosis* on the one hand and of *ill-balancing* of the food on the other. This may be illustrated by the following average diet scales (*vide* table I) of several Indian races and nationalities of which a study of diet was either completely or partially undertaken, the difficulty in presenting a more accurate and reliable diet scale for each of the various nationalities being due to the fact that no extensive and thorough dietetic survey has been ever undertaken for any of them.

It will be evident from the above table that the staple article of diet of the Indian masses is a cereal grain of one kind or another, *viz*, rice, wheat, millet, maize and barley—and sometimes a mixture of two or more of these. Of these, again, rice forms the main source for the majority of the people in India. The defects and deficiencies associated with the use of milled rice in this country are now widely known and cannot be too often emphasized. There is, however, a good deal of difference in respect to the amount and quality of protein, the quality of cereal grains, the quality and quantity of fats, the minerals, vitamin contents and the balance of the food as a whole. In fact, there is a gradually diminishing value of food from the north to the east, south and west in India, the fall reaching the lowest limit amongst the rice-eaters of the east and south. There is also a gradual fall in the amount of animal protein, animal fats, and vitamins entering into these diets. The North Indian diets are mainly deficient in carotene, vitamins A and D and calcium content, whereas the Bengali diet is poor in total and animal proteins, total and animal fats, calcium and to a lesser extent phosphorus and iron. The same conclusion has been arrived at by Wilson, Ahmad and Mullick (1936) in their diet survey of some families and institutions in Calcutta. The South Indian diet, on the other hand, is grossly deficient practically from every point of view, *viz*, total calories, total and animal proteins, total and animal fats, carotene, vitamins A, B_2 and C, iron and calcium. Aykroyd and Krishnan (1937*a*) while making a diet survey in some South Indian villages noted that in poor families which showed

TABLE I—*Showing the average diets of races, nationalities and religions in India*

QUANTITY IN OUNCES

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TABLE I—*Showing the average diets of races, nationalities and religions in India*

Class or creed		Quantity in ounces																Protein in gm.	Fat in gm.	Carbohydrate in gm.	Total calories	Authorities
		Rice	Bajri or jawar	Wheat atta	Bread, biscuits, etc.	Dal	Meat	Fish	Ghee or butter	Vegetable oil	Root and green vegetables.	Fruits	Sweets or jaggery	Milk	Curds or butter-milk.	Eggs	Others					
North India (Punjab).	Balanced	6	..	12	..	1	2	..	1.5	1	16	4	..	20	..	..	..	105.5 **94.95**	96.4 **86.76**	484.2 **435.78**	3,221 **2,899.9**	McCarrison (1928).
	Agricultural	..	..	30	..	3	1.1	..	..	1	4	..	4	4	16	..	..	163 **146.7**	54.7 **49.23**	705.5 **634.95**	3,966 **3,569.4**	Majumdar (unpublished).
Ajmere Merwara.	Agricultural	..	8	12	..	2	..	..	1	1	4	..	2	6	4	..	6 (khitahari).	92.5 **83.25**	70 **63**	612.5 **551.25**	3,450 **3,115**	Do.
United Provinces.	Agricultural	..	16	..	..	4	..	..	0.25	..	4	..	1.5	..	..	..	..	72 **64.8**	11.5 **10.35**	482 **433.8**	2,382 **2,143.8**	Do.
Bihari	Jail	16	..	10 or 12 (makai)	..	6	..	..	..	0.64	6	..	..	..	..	..	..	106 **95.4**	33 **29.7**	643 **578.7**	3,293 **2,963.7**	McCay (1910).
Bengali	Rich	4	..	6	..	1	4	4	3	2	6	4	2	12	..	..	..	115.2 **103.68**	152.4 **137.16**	364.2 **327.78**	3,289 **2,960.1**	Megaw, Bhattacharya and Paul (1928).
	Middle	16	..	..	..	2	..	2	1	1	8	4	1	6	..	..	..	72.4 **65.16**	65.2 **58.68**	490.2 **341.18**	2,837 **2,553.3**	Do.
	Poor	22	..	..	..	2	..	1	..	1	7	2 (mangoes)	..	..	..	..	1.5 (muri)	66.1 **59.49**	35 **31.5**	621.6 **559.44**	3,066 **2,759.4**	Do.
	Jail	26	..	..	..	6	..	..	..	0.64	6	..	..	..	..	..	..	93 **83.7**	30 **27**	693 **623.7**	3,434 **3,091.6**	McCay (1910).
	Agricultural	20	..	..	..	1.5	..	2	..	1	4	..	1	..	..	..	..	58 **52.2**	34 **30.6**	577 **519.3**	2,846 **2,561.4**	Majumdar (unpublished).
Mohammedans (general).	Rich	20	..	1	1	1.5	4.5	5	0.25	0.75	4.5	3	..	4	..	0.5	..	115 **103.5**	49 **44.1**	588 **592.2**	3,253 **2,927.7**	Taylor, Martin and Thant (1928).
	Poor (Calcutta).	8	..	8	2	1	2	1	..	1	6	2	..	..	..	..	..	76.2 **68.58**	40 **36**	440.5 **396.45**	2,425 **2,182.5**	Megaw, Bhattacharya and Paul (1928).
Hindus (general).	Meat eaters.	20	..	2	..	1	1	1	0.5	0.75	4.5	2	..	2	..	..	..	68 **61.2**	42 **37.8**	597 **537.3**	3,038 **2,734.2**	Taylor, Martin and Thant (1928).
	Vegetarians.	18	..	5	..	1	..	..	0.75	0.75	5	2	..	4	..	..	..	66 **59.4**	48 **43.2**	610 **549**	3,136 **2,922.4**	Do.
Madrassi Hindu.	Rich	23	..	..	..	1.2	..	..	0.4	1.2	6	2	1	7	9	..	1.9 (black gram).	84.1 **75.69**	94.7 **85.23**	714.5 **645.05**	4,056 **3,650.4**	McCarrison (1928).
	Poor	21	..	..	..	0.7	..	0.06	..	0.1	2	0.05	..	..	..	..	0.7 (black gram).	47.68 **42.92**	7.97 **6.17**	578 **520.2**	2,583 **2,324.7**	Do.
Chittagonian	Coolies (in Burma).	26	..	..	.	1.75	..	0.1	..	0.25	2.1	..	..	..	..	..	..	59 **53.1**	12 **10.8**	710 **639**	3,184 **2,865.6**	Taylor, Martin and Thant (1928).
Oriya	Coolies (in Burma).	36	..	..	..	5	..	0.25	..	0.5	0.5	..	..	..	..	..	..	98 **88.2**	24 **21.6**	1,020 **918.6**	4,688 **4,219.2**	
Telugu	Coolies (in Burma).	34	..	..	..	5	..	0.5	..	0.3	0.5	..	..	..	..	..	..	104 **93.6**	19.5 **17.55**	988 **889.2**	4,544 **4,089.6**	
Indian Christians.	At Calcutta	16	..	..	2	1	2	2	0.5	1	6	2	..	..	..	..	..	67.2 **60.48**	47.2 **42.48**	523.1 **470.79**	2,786 **2,507.4**	Megaw, Bhattacharya and Paul (1928).
Anglo-Indians.	At Calcutta	1.5	..	..	12	..	12	..	1	..	8	5	2	2	..	2	6 (soup)	116.4 **104.76**	62.4 **56.16**	503 **452.7**	3,039 **2,735.1**	Do.

Black figures indicate 10 per cent deduction from the total to allow for wastage.

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obvious lack of energy and initiative and a tendency to œdema the average caloric intake was only 1,664 per c.u. The situation in Madras has, however, been better depicted in the following table (table II) in which Aykroyd has recently compared the food supply per capita of Madras Presidency (1933) with that of Japan (1927) and of the United Kingdom (1934):—

TABLE II

Comparison of the Madras Presidency diet with those of Japan and Great Britain

Nationalities	Proteins			Fats			Carbo-hydrate	Total calories
	Vegetable	Animal	Total	Vegetable	Animal	Total		
United Kingdom (1934)	41	46 (52.8 per cent)	87	15	109 (87.9 per cent)	124	425	3,246
Japan (1927) ..	72.6	15.9 (10 per cent)	88.6	14.2	3.5 (20 per cent)	17.7	537.6	2,732
Madras Presidency (1933).	40	2.6 (6.1 per cent)	42.6	36.5	1.3 (3.4 per cent)	37.8	398.5	2,068

Considering 2,500 calories per c.u. per adult man as the requirement in South India, the above figures fall short by at least 18 per cent; protein intake is low and that of both animal protein and animal fat is almost negligible. Besides, there are other defects already noted. On the whole, most Indian diets, as shown in the table, are *ill-balanced* when compared to the accepted standard and suffer mainly from deficiency of protein and to a certain extent fat. Carbohydrates on the other hand are rather in excess, and mainly account for the high total calories in some of the diets shown in the table. But the relative proportion of deficiency of other principles, *e.g.*, minerals, vitamins, etc., vary with different races, nationalities and provinces and the actual deficiency diseases from which they usually suffer are the ones enumerated at the outset.

Nutritive values of various Indian diets

The nutritive values of diets in common use in the five main racial divisions of India have been determined by feeding experiments on rats by McCarrison. All the animals were housed under identical conditions, and one group received a diet similar to that used by the Sikhs of Northern India, amongst whom some of the finest physical specimens of mankind are to be found. These animals grew at a normal rate and developed into perfect adults which kept remarkably free from disease. In other groups of rats fed on diets similar to those used by the less well-nourished people of the southern parts of India the growth curves were not satisfactory and there was a high incidence of disease cutting short their span of life. Among the diseases noted were infections of the respiratory organs, duodenal ulcers, etc., very similar to those found in human beings. The other three groups respectively received the Central India, Bombay, and Bengal diets. At the end of the experiment the diets belonging to the above divisions ranged themselves in the following descending order of nutritive value: North India, Central India, Bombay, Bengal, and South India. It is needless to say that the same order or arrangement is found when different races are compared according to their physical developments, and that this difference in the nutritive values of these diets is perhaps reflected in the diseases from which the people of the north, east, and south of India usually suffer.

Relative values of diets compared to the distribution of diseases

McCarrison (1936) also compared the relative values of the above diets with the frequency of distribution of certain tropical diseases, *viz*, pulmonary tuberculosis, leprosy, beri-beri, gastric and duodenal ulcers, diarrhœa, and dysentery, per 1,000 of the sick persons in these divisions. The result is shown in table III.

It will be evident from this table that the distribution of certain diseases is in inverse ratio proportional to the nutritive values of their diet irrespective of climate, race, environments, etc. That a close relationship exists between diet and the incidence of tuberculosis has now been long established, and there can be little doubt that want of proper nourishment of the body is the underlying cause of the appalling incidence of tuberculosis in this country.

Leprosy seems to have a similar tendency. This point was clearly defined a few days ago by Dr. Lowe (1937), the officer in charge of the leprosy inquiry at the Calcutta School of Tropical Medicine, in his discussion on the epidemiology of this disease. He agrees that leprosy does appear to be common among those people whose diet is ill-balanced and that in India the disease is much more common in parts where rice forms a staple part of the diet and when protein, fat and vitamins are little taken. He finds it common among the rice-eating

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TABLE III

Showing the frequency distribution of certain diseases per 1,000 of the sick persons compared with the nutritive values of diets in the five main racial divisions in India (McCarrison)

Racial divisions	Relative values of diets expressed as average weight in grm. of the experimental rats	Distribution of diseases per 1,000 of the sick persons				
		Pulmonary tuberculosis	Leprosy	Beri-beri	Gastric and duodenal ulcers	Diarrhœa and dysentery
North India ..	233	1.60	0.30	0.02	0.05	13.50
Central India ..	220	1.01	0.84	0.02	0.18	13.75
Bombay	198	2.01	0.70	0.02	0.06	15.00
Bengal	180	2.12	0.96	0.50	0.30	19.80
South India ..	155	2.61	2.95	1.03	2.60	19.20

people of Bengal, Bihar, Orissa and Madras and less common among people whose staple diet consists of wheat, jawar, or other grains richer in protein and among those who take milk and milk products. At the same time he has also pointed out that these differences in the incidence of leprosy in different parts of India may also be explained on the grounds of racial, climatic, and other differences, but he has no doubt that a good diet is an important thing in the prevention of leprosy and a good adjunct in its treatment. Similar findings have been made with regard to diet and leprosy in China and Africa. For instance, Dr. Mayer of Nigeria also concludes that poor food conditions, overcrowding of houses, prolonged period of drought and frequent famines cause increased susceptibility to the disease on account of the resultant starvation and dirtiness of clothing. These conditions, however, fit in well with those of Bengal district, Bankura and some places in Madras where leprosy is highly endemic.

In regard to malaria which occupies one of the foremost places—if indeed not the foremost—among the infective diseases in India, the Health Organization of the League of Nations has emphasized again and again in their reports that economic improvement is an essential preliminary. Colonel Gill, in considering epidemic malaria in North India, often preceded by a famine, says, 'The most important anti-malaria measures may not be antilarval operations, or even the systematic exhibition of quinine, valuable adjuncts though they may be, but the institution of measures to ensure that the labour force is properly housed and more especially properly fed'.

Proximate principles in relation to diseases

A. Proteins

According to western standards the minimum amount of protein that is required in a balanced diet is 100 grammes per m.v. per day, of which at least 50 per cent should be 'first class' protein, *i.e.*, of animal origin. But as in the tropics for the oxidation of proteins, when used as a source of energy, an enormous amount of energy is necessary of which a great deal is given off in the form of heat, the percentage of proteins in the food of the inhabitants should not be too large. In view of this, the standard of 1 gramme of protein per kilogramme body weight per day is perhaps more suitable for this country than the western standard. But in most of the Indian diets not only does the quantity of protein fall much below this modified standard but very little protein of animal origin is included. The high figures of total protein in some of the diets shown in table I are mainly due to the vegetable proteins contained in the cereals taken in great excess. The following table (table IV) will illustrate the percentage distribution of the calories in different Bengali diets :—

TABLE IV

Showing the percentage distribution of calories in the Bengali diets

	Bengal				Great Britain working classes
	Cultivators	Middle class A	Middle class B	Well-to-do	
Protein ..	8	9	12	12	12
Fat ..	10	20	35	47	25
Carbohydrate ..	81	71	52	41	62

The average protein intake of the cultivators and the middle-class people who constitute the mass population in Bengal is in reality lower than even the average Indian figures. The amount of protein increases only slightly with the increasing income. The effect of this low protein diet particularly on the Bengalis has been studied by McCay (1910), Greig (1912) and others.

After discounting all other factors (climate, exercise, etc.) it has been quite clearly shown

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that when protein allowance is materially reduced the people as a whole are less robust, mentally inferior, less enterprising, physically unfit for hard work, comparatively timid and meek by nature, and are subjected to various endemic and epidemic diseases. Orr and Gilks (1931) have supplied more convincing evidence of the above statement from the result of their investigation made on two African tribes in the Kenya colony, living under the same environment but on entirely different diets. One of the tribes, the Masai, live mainly on milk, raw blood and meat. They are a war-like race and are remarkably free from diseases, such as tropical ulcers, pneumonia, tuberculosis, etc. The other tribe, the Kikuyu, lives mainly on cereals. Their individuals are poorly developed, tropical ulcers are common and the mortality from pulmonary conditions is high. Moreover, chemical examination of blood of several individuals of each tribe has shown that the percentage of calcium is within normal range in the Masai whereas it is frequently below normal in the Kikuyu.

Proteins in relation to body defence forces and enzymes

A decided reduction of proteins weakens the defence of the organism against infection and this is probably due to the fact that the fluids of the body normally contain a great variety of the so-called antibodies which are highly complex substances and are protein in nature. Also, the digestive enzymes and other body ferments and the internal secretion of some ductless glands upon which depends the whole mechanism of food and body metabolism, and necessarily health, have been proved to be protein in nature. There should, therefore, be always a surplus of protein-building materials not only to meet the bare necessities of protein constructive processes that go on under normal conditions but also to provide for the steady and adequate supply of antibodies, enzymes, hormones and other body fluids mentioned above.

In the Bengalis, McCay (1908) has actually found deficiency in the percentage of floating proteins of the plasma, the low hæmoglobin value of red cells and lower blood pressure in the systemic arteries, all of which may be accounted for by the under-feeding. Recently Napier and Das Gupta (1935) have come to the same conclusion. That this lowering of the plasma protein plays an important part in the production of œdema has been shown by a large number of workers. The Bengalis are, therefore, predisposed to suffer from the œdema type of diseases owing to this unstable equilibrium caused by the low intake of protein resulting in low plasma protein, so that whenever the metabolic equilibrium is disturbed by either extrinsic or intrinsic factors, or both, the balance is upset and œdema caused as in epidemic dropsy, beri-beri, pregnancy, in the late stages of kala-azar, malaria, etc. Some of the other Indian races whose diets more or less resemble that of the Bengalis are similarly predisposed.

B. Fats

Most Indian diets suffer in respect to the quantity of fat. No doubt in the tropics the standard laid down by the League of Nations for European countries, *viz*, 100 grammes with 50 per cent animal fat, will be excessive and possibly harmful, but the quantity actually consumed in this country does not reach half that standard. Again, the little fat that is used is usually of vegetable origin and hardly any animal fat, which contains vitamins A and D and some essential fatty acids, is included in the diet. In certain provinces, *e.g.*, the Punjab, there are places where people rarely use fat in the form of pure fat or fatty oil, as commonly used in other parts of India. While people in such places suffer from clearly-defined deficiency diseases due to shortage of vitamins A and D, a far greater number of people in India accumulate no reserve of fat and develop a poor resistance against diseases of infective origin. Similarly, an inadequate milk supply both in quality and quantity is one of the most important factors in the causation of child morbidity and mortality in the provinces of Bengal and Madras. The consumption of fat is, however, dependent on the economic and social status of the people, there being a distinct tendency to spend more on fatty foods as the income increases (*vide* table IV).

C. Carbohydrates

The majority of the Indian diets are characterized by a great excess of carbohydrates which contribute about 70 to 80 per cent of the total calories consumed, in contrast with those of other countries, particularly of the west, which range between 50 to 60 per cent only. It has been found that when a diet contains all the essential ingredients, *viz*, proteins, fats, carbohydrates, minerals and vitamins in proper proportion and amount, the carbohydrate part is completely digested, but when the latter is in excess, both digestion and absorption are interfered with and other essential ingredients, such as proteins, vitamins and minerals, are also prevented from being properly and completely absorbed; this results in indigestion, sluggish liver, gastro-intestinal catarrh and chronic ill-health, loss of weight and greatly increased susceptibility to various infective diseases. The effects are much more pronounced in races whose main source of carbohydrate is rice. This cereal has many deficiencies, chief among them being those of calcium, phosphorus, and vitamin-B complex. Besides, its water content is high; it needs a large quantity of common salt for its consumption and has to be taken in large bulk to meet all requirements. The effects of rice on animal organisms, either alone or in combination with other food materials in common use by rice-eaters, were

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studied in pigeons and monkeys by McCarrison (1932). Associated with the symptoms of ill-health and various diseases from which the animals suffered, conspicuous changes were noted in the gastro-intestinal tract, circulatory system, the endocrine organs and the nervous system, many of which have since been traced to particular deficiencies in the diet.

In conformity with the above observations parallel conditions such as poor stamina and muscular development, low powers of endurance and resistance to infection, etc., are found among the rice-eating races, particularly Bengalis, Madrassis and Oriyas. A parallel is also presented in the frequent occurrence among them of respiratory diseases, gastro-intestinal diseases (diarrhœas, dysenteries, cholera, colitis, etc.), malnutritional œdema, various anæmias, skin diseases, beri-beri, and perhaps also epidemic dropsy. In this connection, it will be found in reference to table II that the diseases associated with gastro-intestinal catarrh, *e.g.*, diarrhœas and dysenteries, are, as expected, very common in all the five racial divisions in India and that there is a gradual and distinct increase in the proportion from the north (the Punjab) to the east (Bengal) and south (Madras), the two most important rice-eating countries.

The majority of the Bengalis recently studied by Pal and Ghose (1937) have been found to be suffering from some kind of gastro-intestinal trouble and their stools were highly acid in reaction, containing a fair amount of undigested starch. This acid stool and the other signs of fermentation in the middle-class people of Bengal are due to the consumption of more carbohydrate in their diet than is necessary for them, so that their function of assimilating carbohydrates becomes defective after a prolonged overstrain, and this combined with the deficiency of meat, milk and fruits, etc., ultimately leads to flatulence, hyperacidity, dyspepsia, hypoacidity, diarrhœa, dysentery, etc. In the Madras Presidency the incidence of gastric and duodenal ulcers and of gastric carcinoma is of more frequent occurrence than in any other province in India. Their ill-balanced and faulty diet has been considered as the exciting factor in producing the above conditions.

D. Vitamins and minerals

There is no doubt that milder grades of deficiency of certain food essentials, particularly of vitamins and mineral elements, are much more widespread among the Indian people than the severer grades. And it is also true that the less obvious manifestations of 'deficiency disease' are of vastly greater practical importance than the more obvious but less common diseases, such as scurvy, beri-beri, rickets, osteomalacia, etc., to which the term 'deficiency disease' is usually restricted. That this widespread occurrence of mild deficiency is directly or indirectly responsible for a very large proportion of ill-health to-day, in India, can be shown even from the reports of school inspection which has recently been only half-heartedly undertaken in several provinces of India. The results obtained in 1934 and 1935 from inspection of schools in several provinces are shown in table V below.

The figures shown in table V, though only approximate and incomplete, reveal some interesting facts. A very large section of the children in each of the provinces mentioned are ill-nourished and in this respect the rural areas suffer much more than the urban areas. There is also a wide distribution of the affections of the eyes, teeth, nose, and tonsil including defective vision, hearing and speech, most of which can however be ascribed to some current or past illness of the respective organs. Skin troubles are also fairly common in Bengal, Bihar and the United Provinces. A high figure shown under 'enlarged spleen' in the rural areas of Bengal is probably due to the greater prevalence of malaria in this province. The position of Bengal, in concordance with the nutritive value of her diet, is most deplorable in regard to the physical condition of her school children. This has been further corroborated by Chatterji (1938) who has examined 33,151 Bengali students for physical development, health and nutrition. According to the standard developed by him 44 per cent have been grouped under 'malnutrition'. The situation of Madras is perhaps worse than Bengal. Although no regular survey has been made, the preliminary investigation into the state of nutrition of the school children in South India recently carried out by Aykroyd and his co-workers (Aykroyd, 1937) shows that the children have a low average 'weight for height', poor physique, and commonly suffer from angular stomatitis, xerophthalmia, and phrynoderma (toad skin), etc. It may therefore be supposed that apart from various other factors which may predispose to the development of the above conditions a close relationship exists between the latter and the nature of the diet.

(a) Vitamin-B complex

One of the chief faults of the Bengali and Madrassi diets, as already mentioned, is a low content of vitamin-B complex and a composition which increases the need of vitamin B. This deficiency perhaps plays an important part in, and partially accounts for, the great prevalence of gastro-intestinal disorders in these two provinces. Because of the high incidence of gastro-intestinal diseases in his experimental animals McCarrison (1920) was led to believe that a liberal supply of vitamin B_1 is very important in maintaining the health of the gastro-intestinal tract and that its want is a common cause of gastro-intestinal ailments. Among the most recent results obtained in this connection

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are those published by Baker, Wright and Drummond (1937) who have found that the chief effect of prolonged use of vitamin-B-deficient diet is the remarkably high incidence of gastro-intestinal troubles. The observations recorded by the Swedish investigators (1934) carried out on 17,400 healthy and sick persons provided additional evidence that faulty diet

TABLE V

Showing the percentage incidence of various defects from analysis of school-inspection reports (1934 *and* 1935)

Provinces	Number of children examined	Ill-nourished	Shabbily clad	Skin diseases	Teeth: Pyorrhœa	Teeth: Caries and other troubles	Nose troubles	Tonsils	Adenoids	Enlarged lymph glands	Ear conditions	Eyes: Disease	Eyes: Defective vision	Enlarged spleen	Defective speech	Lung disease	Deformity	Infectious diseases	Others
Bengal—																			
(*i*) Calcutta ..	7,980	10.8	16.3	5.5	..	12.8	2.1	14.5	2.0	10.0	1.0	23.1	..	0.4	0.5	4.4	..	0.5	..
(*ii*) Municipalities ..	8,102	25.5	16.0	5.4	..	10.0	3.0	3.6	0.4	8.5	0.9	9.0	..	1.8	1.3	0.6	..	..	..
(*iii*) Rural areas ..	2,146	32.2	26.4	5.8	..	9.5	1.6	3.4	0.28	2.9	2.0	5.3	..	13.7	0.8	0.4	..	..	..
Bihar and Orissa ..	2,287	42.0 (ill-nourished and diseased).	..	M	..	M	..	..	..	M	..	2.5	6.6	..	..	..	..	..	2.9 (heart disease).
United Provinces of Agra and Oudh—																			
(*i*) Urban ..	93,000	12.0	..	0.15	4.0	9.0	..	8.0		3.0	1.7	6.0	12.0	..	..	..	3	..	..
(*ii*) Rural areas ..	..	19.8	..	3.5	1.3	9.3	..	3.3		1.3	..	5.0	1.0	..	..	..	0.25	..	..
Delhi ..	..	..	11.0 (unclean)	..	..	8.0	..	21.0	..	8.0 (Gland disease).	0.9	24.0	15.0	..	..	..	..	..	..
North-Western Frontier Province.	46,369	..	13.0 (unclean)	0.8	..	7.0	2.0	7.0		..	2.0	8.0	3.0	6.2 (1.2 — malarial).	..	0.15 (tuberculosis).	..	..	..

M = majority of the disease group.

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(particularly 'L-diet'*) deficient of vitamin B is an important cause of gastro-intestinal diseases (*e.g.*, achylia, gastric discomfort, colitis, constipation, diarrhœa, etc.) and anæmia. Pfaffenberg and Mielke (1937) have found benefit in such cases with vitamin-B therapy, particularly in those which were associated with diseases affecting the gastro-intestinal tract, *e.g.*, pellagra, sprue, achlorhydria, etc.

Apart from the gastro-intestinal disorders, certain types of anæmia and a few other diseases in this country have been associated with the deficiency of vitamin B. Thus Napier (1936) found that a diet rich in vitamin-B complex effected a cure in certain anæmias in Bengal (recent work tends to show that vitamin B_6 is an anti-anæmic factor); while Wilson and Ghosh (1937) observe that the bisulphite-binding power is increased in the blood of cases of epidemic dropsy, anæmia, splenomegaly and diabetes, indicating that there is a deficiency of vitamin B_1 or of allied vitamin in the above diseases in Bengal. Basu (1938) finds that the addition of vitamin B_2 has a retarding effect in the experimental production of nodular leprosy in white mice and he has observed improvement in several leprosy cases with anæsthetic patches by treating them with vitamin-B concentrate from yeast.

One of the important factors predisposing to anæmia of pregnancy is undoubtedly a deficient diet particularly during the antenatal period. Wills (1931) showed that vitamin-B deficiency was the cause of a type of macrocytic anæmia in Bombay. Skin affections, impaired digestion, sluggish bowel action and impaired growth, from which many children in this country suffer during the lactating period, are due to a constant mild grade deficiency of vitamin-B complex in the milk.

(*b*) *Vitamins A and D*

Similarly, many of the diseases of Indian women and children are directly or indirectly attributable to the faulty or deficient diet. Rit (1937) is inclined to the view that deficiency of vitamin A plays the primary rôle in the causation of infantile diarrhœa in Bengal and he has treated with great success several cases with halibut-liver oil containing a high percentage of vitamins A and D. Mudaliar and Menon (1932) think that deficiency of vitamin A during the antenatal period greatly predisposes the mothers to puerperal sepsis and they have obtained uniformly good results by the administration of cod-liver oil as a prophylactic, both during and after labour, and also when used in certain prolonged fevers in the puerperium associated with signs of sepsis. Further and much closer investigations are, however, necessary to give the final opinion on this subject. Similar results have been obtained in other countries as well. For instance, Spiegel (1937) treated 11 cases of chronic ulcerative colitis in which other forms of treatment became ineffective, by rectal instillation of cod-liver oil emulsion by means of Murphy drip or a partly clamped enema bag with very satisfactory results.

Evidence of sub-clinical shortage of vitamins A and D, *e.g.*, affections of eyes, teeth, tonsils and skin, prevalence of adenoids and respiratory diseases, etc., will also be found in the school inspection reports given in table V. These are mainly due to the want of sufficient and good quality of milk and animal fat in their diets. Although this might be supplemented by the carotene content of the leafy vegetables and fruits, unfortunately these articles are also only sparingly taken. Moreover, the percentage absorption of carotene on a fat-free diet is about half that on a similar diet containing fat (Wilson, Das Gupta and Ahmad, 1937) and most of it is destroyed by the high heat during the process of cooking, to which these vegetables are invariably subjected before eating.

It has been shown by Roller and Wills that vitamin A is a vital necessity for the normal functioning of the gastro-intestinal tract and that a deficiency causes degeneration of mucous membranes. Recently Moir (1938) is inclined to associate the very high incidence of gastric carcinoma in Anglesey, North Wales (as reported by Empire Cancer Campaign, *B. M. J.*, 11th December, 1937, p. 1181), with that of vitamin-A deficiency which is well marked in that part of the country. While such relationship may be a mere coincidence it may be mentioned that a similar speculation can also be made for the distribution of cancer in India where the incidence of gastric carcinoma is highest in the Madras Presidency, the population of which greatly suffer from the deficiency of the above vitamin.

(*c*) *Vitamin C*

Spongy and unhealthy gums, carious teeth, aching in joints and ankles with occasional swelling, painful legs, etc., which are fairly common in this country, and some of which are usually mistaken for rheumatism, have often been proved to be due to insufficient vitamin C in the diet. Pyorrhœa alveolaris is frequently found in persons whose diets contain far too little fresh vegetable foods. Although it is difficult to conceive the condition of actual vitamin-C shortage in a country where plenty of green vegetables and fresh fruits may be obtained, there is undoubtedly a sub-clinical shortage of this vitamin particularly due to the fact that it is easily destroyed by heat and boiling to which all foods are subjected before eating. This condition is especially applicable to Bengal where, in addition to the defect caused by cooking, fruits and milk are very sparingly taken. Children in this province are usually irritable,

*'L-diet'—An unvaried diet consisting of refined flour, milk, potatoes and little butter, with little or no meat, fresh fruits, or vegetables.

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lacking in stamina and are more or less retarded in growth. And it has been shown that they can be restored to better growth, higher stamina and better general health and disposition by feeding an additional amount of vitamin C in the form of orange juice, tomato juice and other suitable anti-scorbutic foods.

Gastro-intestinal troubles, such as hyper-acidity, pain, indigestion and gastro-duodenal ulcers, are very common in this country. A large number of workers have definitely associated vitamin-C deficiency with the incidence of peptic ulcers and claim that a definite improvement has followed a liberal or excess supply of vitamin C in such cases. The references on this subject may be found in a very recent paper by Lazarus (1937), in which he has shown the presence of a state of sub-scurvy in patients with peptic ulcer, particularly in cases complicated by hæmatemesis and melæna. On the evidence of clinical observation the author has recommended a liberal supply (200 m.gm.) of ascorbic acid daily and emphasizes the importance of maintaining the general condition, health and nutrition in such cases.

These ulcers have a peculiar distribution in India being common amongst the rice-eaters of Bengal and South India, and are very prevalent in Travancore. It has been shown in the laboratory that the tapioca diet of the poorer class Travancorians will cause this condition in 27 per cent of the albino rats fed upon it, that of the poorer class Madrassi in 11 per cent, while the lacto-vegetarian diet of the Sikh affords the animals complete protection against it.

There are perhaps other diseases, in this country, in which a sub-clinical shortage of vitamin C may be found, *e.g.*, anæmia, epidemic dropsy, etc. In short, mild grade of hypo-vitaminosis is supposed to be the cause of high incidence of so many tropical diseases in this country.

In this connection it will be interesting to note that a pernicious type of anæmia may be produced in albino rats by feeding them on a diet of oatmeal, linseed meal and patent flour (McCarrison, 1932). It is caused by *Bartonella muris*, the rat-louse-borne organism which is also known to produce a profound anæmia in splenectomized animals of this group. This finding, as McCarrison also pointed out, has a great significance in malaria, kala-azar and splenomegalies—diseases widely prevalent in this country and favoured in their course and development by famine conditions—as the protective resources of the spleen may be injured by faulty nutrition in a way comparable to that brought about by splenectomy in rats.

Overeating

Before concluding, a few words may be said about the incidence of diseases associated with overeating. There is, no doubt, a small group of men amongst all nationalities who indulge in this practice and ultimately fall victims to dyspepsia, indigestion, diabetes, heart and kidney troubles, high blood pressure, etc. They are usually large-type men and may be called the 'plethoric' type. Their condition is much the same as observed in other countries and they generally have shorter lives than the average. Diabetes is fairly common, particularly in Bengal, and although overeating is one of the most exciting factors it is perhaps more due to high carbohydrate diet and lack of exercise than to actual overeating. Nevertheless, this question is not so acute in this country at the present moment as that of underfeeding and ill-feeding.

Conclusion

From what has been stated above it may fairly be concluded that a general dietetic deficiency is more or less prevalent all over the country and that apart from the clinically-defined deficiency diseases enumerated at the outset a sub-clinical state of deficiency is the primary cause of the general ill-health and lowering of resistance of the various races and nationalities represented in India and is indirectly responsible for the most severe ravages of this country by the various tropical diseases, such as malaria, kala-azar, tuberculosis, leprosy, cholera, gastro-intestinal disorders, anæmias, diarrhœas, dysenteries, etc.

The problem of nutrition in India can thus be resolved into a single question: 'What are the effects of diets composed mainly of cereals (carbohydrate) and deficient in proteins, fats, minerals and vitamins on the people using them and how to remedy the defects?' This problem may be approached in two ways: (*i*) by an epidemiological survey of diseases with special reference to dietary conditions, and (*ii*) by animal experimentation and food analysis. The latter has, to some extent, been followed in several laboratories in India and although studies in this line are yet grossly incomplete, the results already obtained sufficiently warrant the conclusion that widespread mild deficiency is present almost all over India. In regard to the former method, however, the work has never been undertaken so seriously in this country, but the possible relationship of tuberculosis, leprosy, epidemic dropsy, respiratory diseases and gastro-intestinal disorders, *e.g.*, diarrhœa, dysentery, cholera, peptic ulcers, etc., to dietetic deficiency has been indicated. It may also be suggested that the incidence of other general diseases, such as, malaria, kala-azar, splenomegaly, etc., is, to a certain extent, dependent upon the nutritive factor as well. In view of this, along with the dietetic survey, one on epidemiology of the diseases should be simultaneously carried out and the rôle of intestinal flora in the incidence of diseases should also be investigated. It will be found that the solution of the problem of prevention of diseases in India is one of improvement of conditions of

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living as of food supply of the people by improvement in the methods of agriculture, animal husbandry and industry and lastly by restraint on reproduction.

'The use of properly constituted diet is a sure means of attainment of physical efficiency and health' (McCarrison).

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Medical News

SUMMARY OF TUBERCULOSIS NEWS FOR THE MONTH OF MARCH 1938

THE 24th annual conference of the National Association for the Prevention of Tuberculosis, London, will be held in the Great Hall, British Medical Association, Tavistock Square, London, W.C.1, on 30th June and 1st and 2nd July, 1938, and will be preceded by an annual meeting of the Care Committee on 29th June, 1938 (in the morning).

Major-General E. W. C. Bradfield, C.I.E., O.B.E., K.H.S., I.M.S., chairman, King George Thanksgiving (Anti-Tuberculosis) Fund, and Lieut.-Colonel C. M. Nicol, I.M.S., chairman, Punjab Provincial Anti-Tuberculosis sub-committee, have been nominated by the central fund committee of the King George Thanksgiving (Anti-Tuberculosis) Fund as official delegates for this conference.

Eleventh Conference of the International Union against Tuberculosis

In accordance with the recommendation of the executive committee, the council of the Union has decided to summon in Berlin in 1939 the next conference of the International Union against Tuberculosis. The exact dates will be decided later. The executive committee has suggested the following subjects for discussion on the agenda of the conference:—

Biological subject.—'The problem of the virulence of tubercle bacillus'.

Clinical subject.—(*a*) 'The value of systematic examinations for the diagnosis of pulmonary tuberculosis'.

(*b*) 'Intestinal tuberculosis'.

Social subject.—'The rehabilitation of the tuberculous. The best conditions of work'.

Her Excellency the Marchioness of Linlithgow's Appeal for the King-Emperor's Anti-Tuberculosis Fund

The position as regards collections as on 21st March was that Rs. 23,89,423 had actually been received and banked in New Delhi. Collections actually made in the Provinces and States, but which have not been remitted to New Delhi, total a further Rs. 11,67,750—making the total just over Rs. 35½ lacs.

Comparisons with the collections for the Silver Jubilee Fund in 1935, when a total of just over 128 was made available, cannot be completely satisfactory. But, so far as can be gauged, collections for Her Excellency's appeal are in advance at present of those for 1935; and it is to be hoped that this progress will be maintained.

The cause must appeal to everyone.

HER EXCELLENCY'S ANTI-TUBERCULOSIS DRIVE

PLANS are now being actively prepared for an intensification of the campaign on behalf of the Marchioness of Linlithgow's appeal for the King-Emperor's Anti-Tuberculosis Fund.

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Efforts are being made to focus public attention on the need to fight a disease which is playing such havoc with Indian lives, and to secure the widest possible support for the Fund, which has already met with a good response both in British India and the Indian States.

Proposals are being considered for the preparation of a film to be shown throughout the country, and for a series of broadcasts which will indicate the incidence of the disease in India and outline the new proposals to counteract it.

Great Britain's interest

Deep interest in the Fund is also being shown in Great Britain where a group of influential people have recommended it to the British public.

It is anticipated that provincial fund committees which have been formed will also be able to promulgate its aims and purposes in lectures. Leaflets, pamphlets, and posters are being prepared for all-India distribution, and special efforts will be made to reach the rural population by means of publicity carried out in the vernaculars. Suggestions have been made that exhibition booths should be established at important *melas* throughout the country, to supply visitors with literature regarding the disease and to bring the Fund to their notice.

'The tuberculosis menace has world-wide incidence, and the Fund now established is intended to bring the most scientific ideas to help in minimizing its ravages in this country and to benefit from the research which has been carried out elsewhere'.

The need for developing preventive and curative measures in the rural areas is everywhere emphasized, and the hope is expressed that the public response for funds will be immeasurably strengthened by an educative campaign showing the perils of the disease and indicating the means by which they may be combated.

More serious than cholera

The people of India are deeply concerned at the prevalence of tuberculosis in the country. There is no doubt that tuberculosis, usually in the pulmonary form, is the most insidious disease that India has to face; it is more serious than plague or cholera, because although those diseases come in severe epidemics their heavy mortality does not last long, while tuberculosis is always there exacting a heavy and constant toll.

This toll falls principally on the most valuable section of the population, on the young adults; on the young men, the breadwinners of the family or the students, and on the young women who are mothers and who keep the home together. It is impossible to state with complete accuracy how many die each year in India from tuberculosis, because the vital statistics throughout the country as a whole are not sufficiently complete.

'Many deaths from tuberculosis are undiagnosed and unreported'.

Some Indian cities

Even as it is the cities of Poona and Ahmedabad report that one out of every 12 deaths occurring in their limits is due to tuberculosis: Cawnpore reports that one in every 11 deaths is from tuberculosis and in Calcutta the number is regarded as being higher.

Here is a brief statement showing by comparison the number of deaths from pulmonary tuberculosis per 100,000 of population in certain cities of England in 1933 and of India in 1934: only a few cities including the worst in each country are given.

Ipswich	53
London	82
Birmingham	86
Manchester	104
South Shields	138
Lucknow	223
Calcutta	230
Poona	324
Ahmedabad	389
Cawnpore	422

Cawnpore and Ahmedabad may be called the Manchesters of India, for their industries are similar to those of Lancashire: their mortality rates are a contrast. But the real figures for Indian cities are for the reasons above stated certainly higher than those here given: it has been estimated that in Lucknow probably about one in every seven persons dies from tuberculosis.

Increasing

Whatever the actual figures may be the number of tuberculosis deaths in India is very large; there is a general feeling that it is increasing.

History shows that when a rural agricultural people begin largely to change their mode of life, to move into the cities, and to take to indoor and factory industries, they tend to become heavily infected with tuberculosis. Primitive people are free from tuberculosis, but very susceptible to it; so long as they do not meet the germ of the disease they remain healthy.

Gurkhas' death rate

This fact is exhibited by the tuberculous death rate of Gurkhas who come from the more isolated areas of Nepal as compared with that of the other races of soldiers in the Indian Army: during 1935 the tuberculous mortality rate among Gurkhas was three and a half times that amongst sepoys from the rest of India.

It is again exhibited by the higher tuberculous death rate in the Bombay police force of the Pathan constables as compared with their Mahratta colleagues. During the process of adaptation to a city or industrial life primitive folk suffer heavily from tuberculosis, until at last when the nation becomes accustomed to urban life and when the people have acquired in time clean cities and good laws of health they suffer less because by this time they have largely acquired an immunity to the disease.

European experience

Examination of the city population of Europe shows that over 90 per cent of the adults have been infected with tuberculosis, but they do not suffer from it so much because having acquired some immunity they are able to resist the disease. That is the story of tuberculosis in England and Wales and Scotland.

When England began to change from an agricultural to an industrial country in the eighteenth century the death rate from tuberculosis was appalling. How high it was is not exactly known as registration was not perfect then, but it remained very high throughout the first half of the nineteenth century and then from 1865, by which time satisfactory statistics were obtained, the death rate began to fall steadily and has continued to fall until the present day.

A successful fight

The same story may be told of the history of tuberculosis in the United States of America, though here the improvement was later and it was not until the year 1900 that the decrease in tuberculous diseases began; but when it began the decrease was so rapid that the cities of that country are, so far as tuberculosis is concerned, among the best in the world. In 1930 the death rate from pulmonary tuberculosis in Chicago per 100,000 of population was only 56, while for Calcutta the reported figure was as much as 240.

The cities of Europe can tell a similar story of improvement achieved, and of further improvement still proceeding. In India the people are still highly susceptible to tuberculosis: they are in the intermediate stage above described and the death rate is very high, and perhaps still increasing.

What India has to face

That is the position India has to face.

'It is all important not only that her people should realize the position, but that they should act upon a definite plan, following a campaign against the disease that shall be centrally advised and locally carried out.

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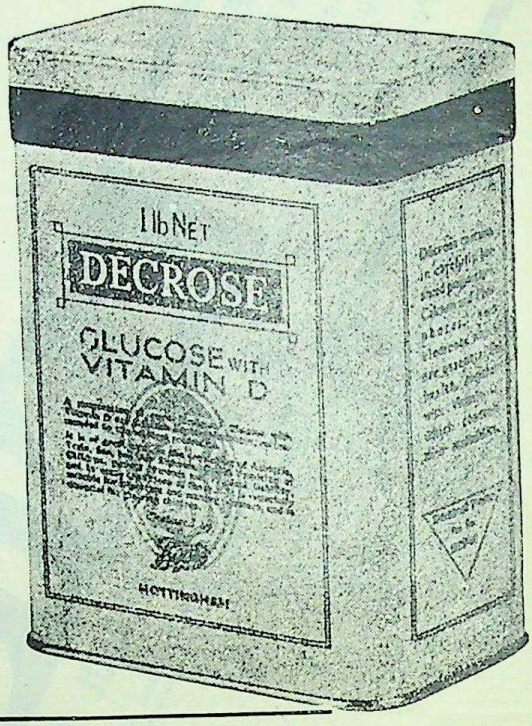

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Haphazard effort and the uncontrolled charity of local philanthropists or of municipalities are likely to lead to the establishment of a few sanatoria and dispensaries here and there working without co-ordination either with health authorities or with one another.'

India however has the experience of other countries to guide her and an epitome of their experience is well given in a recent Bulletin of the Health Organization of the League of Nations.

The organization declared that only limited results and at enormous expense could be expected from treatment only; and no country has yet been able to afford sufficient sanatoria for all its cases of tuberculosis. Following the League's advice the tendency is to turn towards 'preventive medicine and social hygiene whose essential weapon is the dispensary'; in co-ordination with the dispensary will work tuberculosis hospitals and settlements. On the social side chief attention must be to housing, to education and to nutrition, especially of children.

Both His Excellency the Viceroy and Lady Linlithgow are taking the keenest personal interest in the problems of nutrition and tuberculosis in India, and it is hoped that under the controlling ægis of the King-Emperor's Fund, the people of India will be aroused to co-ordinate effort and that the campaign against the disease will show increased activity and truer direction.

RED CROSS AND ST. JOHN AMBULANCE

H. E. THE VICEROY'S TRIBUTE

'HIS EXCELLENCY THE VICEROY had words of high praise for the work of the St. John Ambulance Society and the Indian Red Cross in his address at the joint annual general meeting of the two bodies, held in the Viceroy's House, New Delhi, on 24th March'.

H. E. The Viceroy said:

It is gratifying to hear again of the satisfactory progress during the year to which Sir Ernest Burdon has referred to in his report both as far as the St. John Ambulance Association and the Indian Red Cross Society are concerned.

To one whose daily bread is the study of politics and its conflict of interests, it is encouraging to turn to a sphere of activity where enthusiasm and unity of interest in humanitarian activity contrive to produce such satisfactory and beneficial results.

I am glad that your chairman referred to the All-India Ambulance competitions which took place at the Irwin Stadium, New Delhi, from 2nd to 4th February of this year. I would like to congratulate those who were responsible for the organization of those competitions. I was much interested in what I saw of them and I am convinced of the value that these competitions have, not only for those who are members of the association already, but for the general public as a whole who must realize from them the value of the work which the association does.

I agree, too, with the chairman as to the value of the organization of classes in 'Air-Raid Precautions'. In any work such as that with which your association is concerned, 'Be Prepared' is as sound a watchword as in any other. But I am sure I express the hope of all present here that the day will be far distant when the lessons learnt will have to be put into effect.

Indian Red Cross Society

The Indian Red Cross Society too deserves its full share of congratulation for its valuable activities in connection with affairs outside India as well as within India itself.

I am particularly gratified to hear of the increase in numbers of the Junior Red Cross and the valuable part that the school groups are playing in village improvement work. You know my interest in the problem of nutrition and the activities of the Red Cross Society in that respect have my fullest support.

I am convinced too of the value of the film and wireless in disseminating knowledge with regard to public health. I hope that the Headquarters Cinema Section which has been so successful hitherto will be able to see its way to extending its activities and preparing more films. And here I would like to congratulate the Punjab Red Cross on receiving a gold medal at the All-India Industrial Exhibition in Lahore for its exhibits in connection with health and child welfare.

We have full occasion to-day to congratulate ourselves on the activities of the past year. But I must, too, record the grievous loss which the societies will incur by the termination of the services of Miss Norah Hill who for nine years has been the organizing secretary of these two great institutions.

I would like to refer to the Anti-Tuberculosis Appeal of which Sir Ernest Burdon made mention in his speech.

I think it is now generally recognized that, given persistence and enthusiasm, this appeal has within it the power to render service of outstanding value in the annals of health work in India. In such appeals, as you will all recognize, much depends on hard work and enthusiasm both in the early stages and in later times when there is the possibility that interest might die out.

THE INDEPENDENT MEDICAL PRACTITIONERS' ASSOCIATION, TINNEVELLY

THE first anniversary meeting of the above association was held on 12th March, 1938, under the presidency of Dr. R. Sundaram, M.D. After the reading of the annual report of the association by the secretary, Dr. D. V. Venkappa, the provincial secretary, the All-India Medical Licentiates' Association, Madras, read the memorandum submitted by that association on the G.O. on the honorary system of medical service, published by the Government of Madras a few months back and gave a short résumé of the salient defects in the system.

Then Dr. R. Sundaram delivered his address—'Our Profession: Some Thoughts'. He traced the progress and development in medicine and surgery during the past 50 years. He dealt with the advances made in anæsthesia, in tropical medicine, in bacteriology and biochemistry, endocrinology and hormone therapy, radiology and radium therapy, neurology and psychiatry, and in therapeutics. Regarding the future of the profession, he said more attention should be paid to the preventive side rather than to the curative, and spoke a few words regarding the correct code of conduct for medical men, and wound up his lecture by saying that medicine, though a noble profession, is a sorry trade and, if the making of money is the chief aim of man, this is not the profession for him. After the usual vote of thanks the meeting terminated.

THE DR. B. S. SHROFF MEMORIAL GOLD MEDAL OF THE BOMBAY MEDICAL UNION

THE following subject has been selected by the Bombay Medical Union for competitive thesis for the above prize for 1938:—

'Tuberculosis in general, paying special attention to its prevention and treatment'.

The award will be in the form of a gold medal called the Dr. B. S. Shroff Memorial Gold Medal of the Bombay Medical Union.

The competitor must be (*i*) a duly qualified member of the medical profession holding a degree or degrees and diplomas from Indian and other universities created by statute, or (*ii*) a duly qualified member of the medical profession holding the diploma of Membership of College of Physicians and Surgeons of Bombay.

The thesis must be sent in six typed copies so as to reach the honorary secretaries, Bombay Medical Union, Blavatsky Lodge Building, French Bridge, Chowpatty, Bombay, on or before the 15th August, 1938.

The thesis should be designated by a motto instead of the writer's name and should be accompanied by a sealed cover containing the name of the writer and his post-office address.

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The name of the prize, the year of competition, the subject of the thesis and the writer's motto should be superscribed on the cover.

No study or essay that has been published in the medical press or elsewhere will be considered eligible for the prize, and no contribution offered in one year will be accepted in any subsequent year unless it includes evidence of further work.

The accepted thesis shall be the property of the Bombay Medical Union.

All other theses shall be returned if not accepted, provided the return postage expenses are paid in advance by the writer.

In the award of the prize to the successful candidate, the decision of the committee shall be final.

Hon. Secretaries,
BOMBAY MEDICAL UNION.

Bombay, 15th February, 1938.

ANNOUNCEMENT OF THE FRANCIS AMORY SEPTENNIAL PRIZE OF THE AMERICAN ACADEMY OF ARTS AND SCIENCES UNDER THE WILL OF FRANCIS AMORY

IN compliance with the requirements of a gift under the will of the late Francis Amory of Beverly, Massachusetts, the American Academy of Arts and Sciences announces the offer of a septennial prize for outstanding work with reference to the alleviation or cure of diseases affecting the human genital organs, to be known as the Francis Amory Septennial Prize. The gift provides a fund, the income of which may be awarded for conspicuously meritorious contributions to the field of knowledge 'during the said septennial period next preceding any award thereof, through experiment, study or otherwise . . . in the diseases of the human sexual generative organs in general'. The prize may be awarded to any individual or individuals for work of 'extraordinary or exceptional merit' in this field.

In case there is work of a quality to warrant it, the first award will be made in 1940. The total amount of the award will exceed ten thousand dollars, and may be given in one or more awards. It rests solely within the discretion of the academy whether an award shall be made at the end of any given seven-year period, and also whether on any occasion the prize shall be awarded to more than a single individual.

While there will be no formal nominations, and no formal essays or treatises will be required, the committee invites suggestions, which should be made to the Amory Fund Committee, care of the American Academy of Arts and Sciences, 28, Newbury Street, Boston, Massachusetts, U. S. A.

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The essay must be unpublished and original, and be based on the candidate's own observation, but it may contain excerpts from the literature on the subject, provided that reference be made to the articles from which they are taken.

A copy of the rules and any further information can be obtained on application to the Honorary Secretary, Mr. Arthur E. Porritt, 27, Harley Street, W.1.

The subject selected for the essay is:—

1938. 'The Management of Inoperable Malignant Disease in General Practice'.
1939. 'Treatment of Obesity in General Practice'.

The 1937 Hunterian Gold Medal for General Practitioners was won by Dr. J. Wilson Reid, of Anglesey, for his essay on:—

'The Prognosis and Care of Heart Disease in General Practice'.

ENQUIRY INTO MEASURES OF REHABILITATION OF PROSTITUTES*

THE provision of social, as well as medical, services in the treatment of venereal disease is a comparatively new feature of social work. The League of Nations Secretariat has just issued an account of the systems prevailing in different countries, acting upon a resolution of the 1937 Assembly that 'an early publication of this information will be of great service to countries contemplating the creation or extension of such services'.

Replies from over forty countries to a questionnaire show that the necessity for cheap medical treatment for venereal disease is now widely recognized. In some countries such treatment is compulsory by law for all sufferers and, as regulated prostitution declines, this group of countries, already the largest, recruits new members; in others, it is only compulsory for prostitutes; and in eight countries, including the United Kingdom, treatment is voluntary, but is encouraged by facilities organized or subsidized by the State, and by propaganda and instruction.

There is not the same wide recognition of the need for social help, and the number of countries where social service is combined with treatment at venereal disease clinics and hospitals is still comparatively small. In countries where social services exist they take different forms. An account is given of the systems in force in two of the countries which rely on individual social assistance—the United Kingdom and France. In the former country help is given through the hospital almoner, who acts as the link between the patients and the social and charitable institutions which might be useful to them; through hostels attached to the public hospitals in London where women recommended by the treatment centres are given free or cheap board and lodging and some general education and training in work and are helped to find employment when they leave, and through training in hospitals. In France the patients are helped by workers attached to hospitals as social assistants. Other countries, such as the Union of Soviet Socialist Republics, whose system is described, have set up special institutions for combined medical and social treatment.

Although it is as yet too early for any method to have proved itself unquestionably the best, the report suggests certain guiding-lines for future planning and should prove of value to social workers in all countries.

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THE name of Major-General N. H. Hamilton, C.B., C.I.E., C.B.E., D.S.O., F.R.C.S., I.M.S., K.H.P., Deputy Director of Medical Services, Northern Command, India, has been brought to notice by H. E. the Commander-in-Chief in India for distinguished services rendered in connection with operations in Waziristan, N. W. F. of India, 17th January to 15th September, 1937.

THE FACULTY OF TROPICAL MEDICINE AND HYGIENE, BENGAL

THE following students are declared to have passed the D.T.M. Examination, Session 1937-38.

Passed with distinction

1. Chanan Lal, L.S.M.F. (Punjab), Medical Officer, Civil Hospital, Rawalpindi.—Awarded the 'Chuni Lal Bose' Gold Medal, 1938.

*Series of League of Nations Publications, 1938. IV, 1, 66 pages. Price: 1/3; $0.30.

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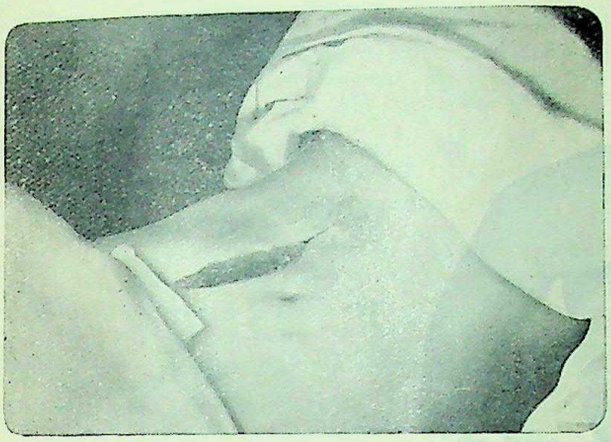

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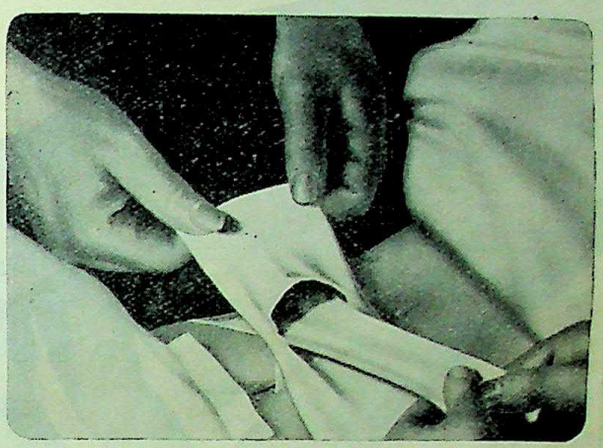

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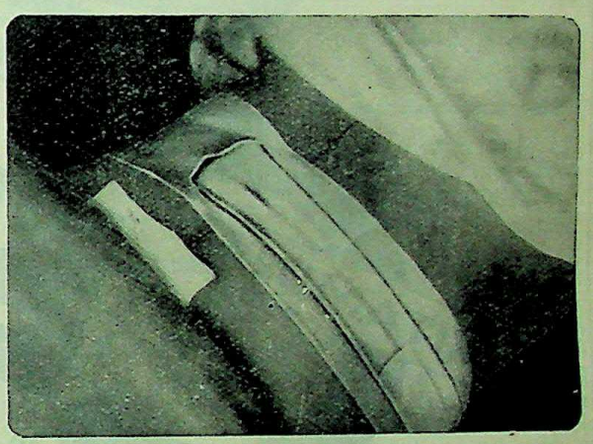

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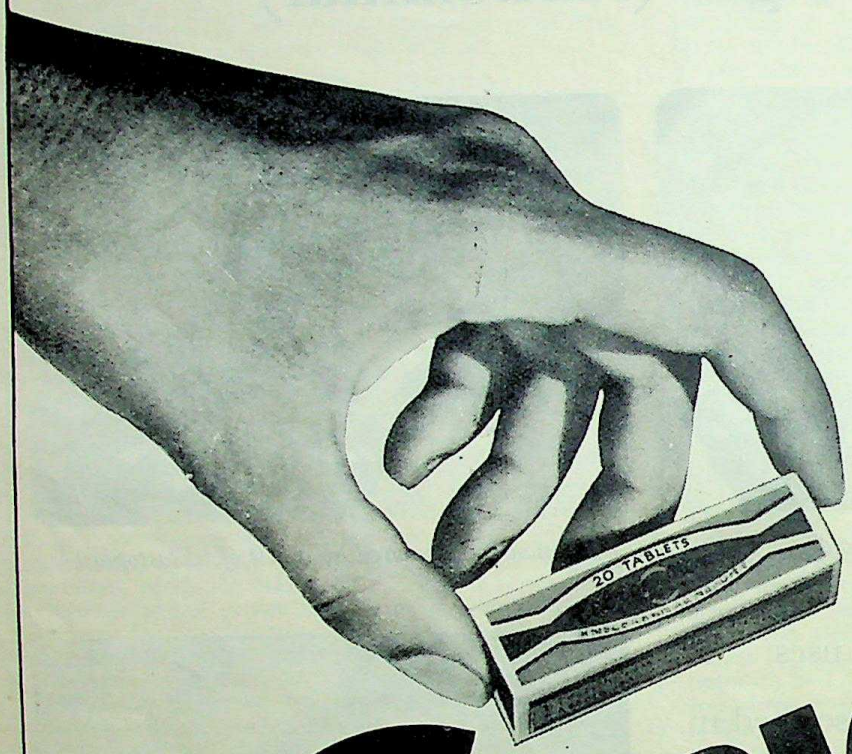

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(Arranged in alphabetical order)

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3. Eric Frederick Bedell, M.M.F. (Bengal), I.M.D., Military Assistant Surgeon, Government of India.
4. Prabhakar Dattatraya Bhave, M.B.B.S. (Bombay), private practitioner.
5. Dwijendra Nath Chakrabarty, L.M.F., L.T.M. (Bengal), assistant medical officer, Burnie Braes Tea Estate, Cachar.
6. Amarendra Nath Chatterjee, M.B. (Cal.), private practitioner.
7. Chiranji Lal, M.B.B.S. (Punjab), private practitioner.
8. Albert Craig, M.B., ch.B. (Aberdeen), M.O., Church of Scotland Mission Hospital, Kalimpong.
9. Nirmal Kumar Das, M.B. (Cal.), private practitioner.
10. Santosh Kumar Dutta, M.B., D.P.H. (Cal.), Medical Inspector, Corporation of Calcutta.
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19. Upendra Kumar Mazumder, L.M.F. (Bengal), assistant medical officer, Chandypore Tea Estate, Cachar.
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21. Mukadi Damodarum Naidu, L.M. & S. (Hyderabad), assistant health officer, Dist. Medak.
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31. Mohan Singh Sethi, M.B.B.S. (Punjab), private practitioner.
32. Shivajee, M.B.B.S. (Patna), private practitioner.
33. Kirpa Ram Sud, M.B.B.S. (Punjab), private practitioner.

Current Topics

Injection Treatment of Hernia

(Abstracted from the *Journal of the American Medical Association*, Vol. CIX, 30th October, 1937, p. 1456)

THE recent wave of enthusiasm over the injection method of hernia had its impetus in the success of sclerotherapy in various veins and hæmorrhoids. Some disappointment with the results of surgical procedures, particularly in cases of direct inguinal hernia, was an additional reason for the revival of a method long relinquished and tainted by quackery.

According to recent reports by Bratrud, Rice, Harris and White, and Fowler the rationale of the treatment depends on the property of mildly irritant solutions to produce a fibrosis when injected into normal tissues, and on the ability of the fibrosis thus produced to obliterate the inguinal canal by causing an intimate adherence of the muscular layers in this region by much the same mechanism as that obtained by suturing. Harris and White injected such irritants into the muscles of the thigh in a group of normal guinea-pigs. They found that these solutions provoked a polymorphonuclear leukocytic response of short duration, followed by a gradually increasing reaction from the mononuclear mesenchymal elements, which later differentiated into spindle cell fibroblasts, resulting in fibrosis. MacMillan and Cunningham, Fowler, Rice and others have obtained similar results. Rice has obtained microscopic proof of the occurrence of fibrosis in human beings in biopsies from patients who have been operated on for the cure of hernia after having submitted to one or two injections at varying intervals before the operation was performed.

The injection method, according to its modern advocates, is applicable only to hernia that can be completely reduced and kept reduced by means of a truss. Its use is contra-indicated in irreducible hernias, in sliding hernias and in the presence of an undescended testis. Injections are further contra-indicated in the presence of superficial skin infections or erosions caused by the truss, in syphilis, diabetes, senility or marked emaciation. Hernias with a wide ring are not likely to give a good result. A *conditio sine qua non* is a properly applied truss capable of keeping abdominal contents out of the sac at all times. This is frequently impossible in obese patients and in nervous and restless children. The case best suited for the treatment is the small, reducible, indirect inguinal hernia in a young person. The complicated hernias and the large hernias of the middle aged and the elderly are the least suited for the injection treatment. Anatomical conditions in a direct hernia, in the umbilical and the femoral hernia, make the injection treatment undesirable, in the opinion of many.

The treatment as outlined by Harris and White consists of (1) from eight to twelve preliminary injections in a period of one month, (2) four reinforcing injections once a week to consume another month, (3) immediate follow-up examinations once a month for six months (if necessary, occasional reinforcing injections may be made) and (4) final follow-up examinations every two months for one year. The entire treatment requires twenty months for each case. The following are possible complications: an unusually severe local reaction, strangulation, perforation of the bowel, fæcal fistula, peritonitis, abscess, atrophy of the testicle, sexual impotence. The needle may enter a vein or artery. The fluid may be placed too deeply or too superficially. If placed too deeply, it may enter the cord or peritoneal cavity. Injection of the cord results in œdema of the penis, scrotum and epididymis. Such swellings are not uncommon with this method. A certain amount of pain and transient swelling occur,

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according to Harris and White, with almost every case. The injection of the fluid into the peritoneal cavity produces an attack characterized by an initial chill and severe abdominal cramps, pain of extraordinary severity in both testes and in the penis, leading to shock. Harris and White state that the fitting and care of trusses require a number of days and careful examination. The treatments themselves are exacting and require skill. The numerous possibilities for dangers and complications make continuous vigilance necessary. 'Even in the hands of competent men, this method may be found unsatisfactory for these reasons'. Harris and White report a recurrence of 4.1 per cent in a follow-up study of 121 completed 'good surgical risk' cases of inguinal hernia. In forty-one cases of inguinal hernia considered a poor surgical risk, their recurrence rate amounted to 19.5 per cent. MacKinney, in a follow-up study of 300 cases, found 83 per cent cured after six months to three and a half years. Rice reported 97.6 per cent cured out of 379 patients after not less than six months. Bratrud, at the University of Minnesota Hospital Clinic, had only nine cases out of a total of 707 in which 'final closure could not be obtained' but states 'I shall be very well pleased if we can keep our recurrences below 10 per cent'.

The statement that the treatment has no fatalities is misleading and unwarranted. Bratrud mentions a case in which 15 minims (1 c.c.) of phenol-thuja solution had been injected into the peritoneal cavity, causing perforation of the ilium and death. Collins observed two fatal cases of pulmonary embolism, a secondary gangrene of the sigmoid and upper rectum, and two complete bowel obstructions resulting from accidental escape of some of the fluid into the peritoneal cavity. Zieman and Larkowski report a case of necrosis of the cord following a single injection of thuja solution.

In striking contrast to the favourable reports of Bratrud, Rice, Harris and White are those of Burdick and Coley reporting from the Hospital for Ruptured and Crippled, in New York. These authors treated ninety-two hernias in sixty-six patients by the injection method. Of fifty-six cases followed up, a definite relapse was noted in forty-seven or 81.03 per cent. At present, eleven patients are apparently cured and nine of these are still wearing trusses. In the face of such disappointing results, they have abandoned the treatment.

Rice states that the end results from this method cannot be accurately adjudged at this time because the results do not extend over a period of more than two years. Bratrud expects not less than 10 per cent of recurrences from the more complicated cases. Fowler states: 'A frank and truthful answer is that as yet we have but little exact and dependable information as to the recurrence rate of the injection treatment'.

Although in the hands of some investigators the results seem to have been good, the complications, the difficulty in selecting suitable cases, and the still uncertain percentage of recurrences would seem to make the method unsuitable except under circumstances in which unusually careful technique and suitable care are possible. Careful follow-up studies for a sufficiently long period will undoubtedly furnish data on which to evaluate it.

Keratoplasty

By R. E. WRIGHT, C.I.E., M.D., Lieut.-Colonel, I.M.S.

(From the *British Medical Journal*, Vol. I, 26th June, 1937, p. 1311)

DURING the last few years much attention has been drawn to corneal grafting by numerous publications in ophthalmological and other journals. The experimental work of Tudor Thomas in England and Cstroviejo in America has illuminated the subject considerably, but has perhaps tended on the whole to emphasize the difficulties of the procedure in the minds of medical men. The demand for the relief afforded by keratoplasty is relatively small in Western countries, and this, together with the comparative scarcity of good material for transplants, limits the field and tends to make the majority of ophthalmic surgeons in the West hesitate to adopt a measure which presents so many apparent difficulties.

Conditions are different in the Near and Far East, where the demand for relief by corneal grafting is considerable and suitable grafting material is easy to obtain. Under such circumstances it is only to be expected that simplification of technique and greater rapidity of execution should be aimed at and acquired, and although reports of cases and operative detail from Eastern Europe, and India and adjoining areas do not show up prominently in the literature, there is little doubt that in these areas much more practical experience has been obtained in performing corneal grafting on the human subject than elsewhere.

A SIMPLE TECHNIQUE

I am not familiar with the exact methods adopted by the various ophthalmic surgeons who freely employ keratoplasty in the East, but I have evolved a simple technique which appears to hold out as good a chance of success as the more elaborate methods described in recent literature. It has the advantage that it can be undertaken confidently by any ophthalmic surgeon of experience. I demonstrated this method in Melbourne at the Annual Meeting of the British Medical Association, but only on the rabbit, as a patient and donor were not available.

The trephine is used for both graft and bed. The nests of trephines made for me by Messrs. Down Brothers give a fair range in size. Although I have employed a 12-mm. trephine on two occasions my impression is that this is too big, not because the graft does not readily take, but because anterior synechiæ are more likely to occur. The formation of an anterior synechia with the back of the graft junction is the complication most to be dreaded in keratoplasty. A 3-mm. trephine is too small except when one employs it for the graft method of treating fistula which I have described. The best average trephine diameter is perhaps 6 mm. There is no real need to have special nests of trephines, although the finish of the edge in specially made cylinders gives a bevel to the margin of graft and trephine hole. Cork borers, such as are found in a laboratory, are almost equally good. No other special instrument is required, although of course it is preferable to use fine needles, such as Barraquer's or Kalt's half circle 7 mm. point to eye (maker's 12 mm.), and a delicate needle-holder such as that made for me by Weiss. The various steps in the procedure are briefly as follows:—

The cornea chosen for grafting should preferably have a normal anterior chamber. (This is highly advisable in earlier attempts. Later, the surgeon may consider what we refer to as reconditioning the anterior chamber before grafting, a much more difficult and tedious procedure.) The graft should for preference be obtained from a living human eye. I have no experience of grafts obtained post mortem. Eyes blind from glaucoma furnish quite good grafts, as do eyes removed in the course of exenteration for malignant disease. It appears to be unnecessary to choose a donor of the correct blood group. The donor and recipient are placed on adjoining tables and prepared in the usual way as regards surgical cleanliness. Akinesia and anæsthesia are established by novocain and adrenalin; pantocaine drops are given. The recipient's pupil should be small, the donor's wide, if this is possible. The necessary instruments for completing the enucleation or exenteration on the donor are left ready and an operator detailed for this work.

PREPARATIONS FOR TRANSPLANTATION

Having decided on the disk diameter and the trephine to be used, the site is demarcated on the recipient's leucomatous cornea by a few rotations of the trephine. The stitches are then put in, taking the first bite at 6 o'clock just off the cornea, where an easy but firm grip can be taken with the point of suture, which does

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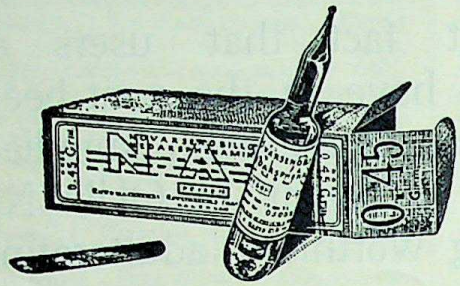

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not produce conjunctival drag or puckering. One end of the thread is held; the needle with the other is carried across the cornea to 12 o'clock, where a similar bite is taken. The needle is then unloaded and the free end carried back to 6 o'clock and laid beside the end already in position. This manœuvre is repeated at points corresponding to 7.30 and 1.30, 9.30 and 4.30. It is well to do this clockwise and remember the order of placing the sutures. One observes how they will eventually be related to the graft by noting where they cross the demarcated area. The stitches are then pulled free of the demarcated area, the lids closed, and attention given to the donor, who now has a speculum *in situ* and is ready prepared.

TREPHINING THE DONOR

Here the same trephine is used in a corresponding position on the cornea. Good fixation of the globe is desirable. This can be effected simply by a T-shaped fixation forceps. The trephine must be used evenly and freely. It is desirable to go right through and get the disk cut away clean as far as possible. There is generally a hinge left: the shorter this is the better. On removing the trephine the disk opens outwards on its hinge, pushed by the contents of the globe. One should try to avoid damaging the uvea and getting pigment on the graft. If the graft tilts, the hinge is easily cut free on the bevel with fine sharp scissors, either fine blunt-pointed or curved, with one sharp and one beaded point. A fine Stevens type of scissors answers satisfactorily.

If the trephining has been well done the hinge consists of a narrow belt of Descemet's membrane, which is readily cut free. The graft must on no account be touched at this stage except with a camel-hair brush or an equally inoffensive piece of apparatus, and then only on the epithelial aspect. Should the hinge be larger and the graft remain *in situ*, it is perhaps best to complete the separation of the hinge with a narrow Graefe's knife. The knife is plunged through the gap already cut, deep into the eye regardless of the lens, which is dislocated backwards if necessary. The edge is then approximated to the hinge, which is cut on the bevel as the knife is withdrawn. This is repeated. Cutting in the other direction is more dangerous to the graft, and Descemet's membrane is more likely to be rucked up. The severed disk is now received—epithelium downwards—on a Volkmann spoon encouraged by a camel-hair brush. It is submerged in saline—or more elaborate physiological isotonic solution—about body heat. Should vitreous or pigment appear to be adherent to the endothelial face it is gently removed with the brush from the centre towards the periphery. The graft is treated from the beginning like a delicate histological section in process of mounting. The donor is then left to another surgeon and the process of trephining the recipient commenced.

TREPHINING THE RECIPIENT

Here one must proceed with great caution. With even rotation, trephine as far through the cornea as possible; it is generally fairly obvious when one is nearly through. A slight tilt is then given to the trephine, which goes through followed by an aqueous escape. In this case the hinge is likely to be much larger, possibly two-thirds the circumference of the circle. Fortunately one can seize the disk in a forceps and deliberately sever the hinge slowly and carefully with a suitable bevel by means of the knife or scissors, such as mentioned above. The chamber is now inspected. Let us assume the pupil is contracted, the iris intact, and the lens clear. This is the ideal background. A little normal saline is run in from the irrigator. This temporarily gives a view towards the angle and leaves a little fluid between iris and cornea.

THE TRANSPLANTATION

The graft is now lifted with the Volkmann spoon and camel-hair brush from its warm saline, tumbled into the aperture, and adjusted to its new position by a few touches of the brush. The stitches are then replaced over it in their order and tied off by means of a pair of forceps suitable for the purpose. Suture-tying forceps are most desirable at this stage, and Silcock's iris forceps are more useful for this than the purpose for which they were originally intended. Atropine and iodoform ointment is now placed in the conjunctival sac, the eye closed, and both eyes bandaged. The patient is kept somewhat quieter than a cataract case, gently examined on the third day, and a little more atropine and iodoform ointment given. The graft has usually taken by this time and the chamber formed. On the fifth day the stitches are removed. Atropine is continued. The patient is allowed to walk to inspection and goggles are given on the eighth day.

POINTS OF GENERAL INTEREST

It is undesirable here to go into all the variations that may have to be adopted if the condition of the recipient's eye is other than that suggested above—for instance, in leucoma adherens with shallow or non-existent anterior chamber and the whole gamut of abnormal conditions in the anterior segment which follow gross corneal ulceration. The procedure of preliminary investigation and preparation naturally varies in every case, but its detailed discussion is more suited to a thesis on corneal plastic methods. There are a few points of general interest and practical importance which may be noted here :

A cornea that has previously been vascularized—for example, one which has been affected by interstitial keratitis or trachomatous pannus—offers better soil for a graft than a cornea free of such old vessels. This has been known for a long time, and is referred to by Elschnig.

A child is a much more difficult subject for keratoplasty than an adult.

It is important to respect Descemet's membrane; it readily lifts, buckles, and detaches at the cut edge.

Anterior synechiæ are liable to form in this situation. These are almost certain to be followed by opacification of the graft unless very trivial and freed early. The use of eserine is preferable to that of atropine in the grafted eye if the graft is large. Atropine may be desirable if the graft is small; this requires judgment. The main object is to avoid anterior synechiæ.

The stitches must not be left too long; they may damage the graft: five days is quite long enough. An optimum result with a clear graft and really good visual acuity is exceptional. Improvement to the extent of allowing a previously 'led' patient to see large objects and get about alone is a modest expectation in straightforward cases. Patients must be warned not to expect too much; this saves disappointment. The most theatrical effects are produced by successful keratoplasty when the blind patient is made to see, but this is by no means the only indication for corneal grafting. As a method of repair it is often far superior to the conjunctival flap, the epithelial graft, and such plastic procedures.

The Early Diagnosis and Treatment of Abdominal Tuberculosis

By R. LIGHTWOOD, M.D., F.R.C.P.

(Abstracted from the *Practitioner*, Vol. CXXXIX, November 1937, p. 535)

CLINICAL FORMS

BEYOND question abdominal tuberculosis, even more than other forms of tuberculosis, is declining, and this is the result of the increasing pasteurization of milk. The symptoms of abdominal tuberculosis are indeed becoming quite uncommon, though paradoxically caseous or calcified mesenteric glands are still often found at operation and autopsy. Evidently there is much symptomless abdominal tuberculosis. In spite of the comparative rarity of clinically manifest abdominal tuberculosis the disease is often suspected and nearly as often wrongly diagnosed on insufficient data.

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If abdominal symptoms arouse suspicion, a tuberculin reaction should be performed. The intradermal test (Mantoux) using 0.1 c.cm. of a 1 in 1,000 dilution of old tuberculin may be employed. A negative reaction for all practical purposes excludes the diagnosis. A positive reaction should lead to a search for other confirmatory evidence.

Tuberculous enteritis.—If a tuberculous ulcer forms the onset of symptoms is likely to be insidious. The symptoms may be pain, loss of weight and diarrhœa. Occasionally the stools may contain a little pus or blood but this is seldom manifest. Confirmation of the diagnosis may be obtained by having the stools examined for tubercle bacilli. Fever may be present together with other general signs of infection. Examination of the abdomen shows it to be tumid, somewhat resistant and diffusely tender.

Tuberculous adenitis.—This must be a common condition, yet most cases pass unnoticed so inconspicuous are its symptoms and signs. The outstanding sign is the detection by palpation of enlarged glands in a child with a positive tuberculin reaction. Their differential diagnosis requires the exclusion of the possibility that the masses may be fæcal. This possibility can be settled by watching the effect of warm olive-oil enemas. Among the general symptoms of tabes mesenterica are abdominal pain (which may give rise to suspicion of appendicitis), slight fever, stationary weight and irregularity of the bowels.

Tuberculous peritonitis.—This is becoming more and more rare. The two chief varieties, the ascitic and the plastic, are so well described in all textbooks that they do not require description here. Ascites in a child whose tuberculin reaction is positive is most likely to be due to tuberculosis. In the plastic form of peritonitis an omental tumour often forms across the upper part of the abdomen and masses may be felt in other situations. Sometimes a tuberculous abdominal mass may be confused with a chronic intussusception. When this difficulty arises Still's sign may be invaluable: the tumour which forms in intussusception shows peristaltic contractions, tuberculous masses do not. An opaque enema may also be of the greatest diagnostic value.

Radiological assistance in the diagnosis of tuberculosis of abdominal glands can only give help in a healing stage, *i.e.*, when calcification has begun. If a child with abdominal glands and a positive tuberculin reaction is *x*-rayed and calcification is visible a good prognosis may be given, because the fact that the glands are visible indicate that healing has been effected or is taking place.

TREATMENT

Estimations of the sedimentation rate are chiefly of value in following the course of a patient under treatment. Complete rest will be required until some weeks after all the signs of activity have passed away. The signs of activity are failure to gain in weight, fever, sweating, abdominal enlargement (and ascites) and a raised sedimentation rate.

The essentials of treatment are complete rest, proper feeding and open air. The severity of the condition determines to what extent rest must be enforced. In the more acute and severe cases the legs as well as the abdomen must be immobilized and a plaster bed is useful for doing this. Other less severe cases can be in bed without special apparatus. Feeding should be sufficient to enable the child to put on weight but it is not wise to recommend 'stuffing'. Anything which increases peristaltic activity of the bowel must be excluded. Hence parents are told to exclude brown bread, porridge unless sieved (and any other of the fancy breakfast cereals), raw fruit and stewed fruit unless sieved, and all green vegetables unless sieved. All jams with pips and skins must be omitted and other articles of dietary such as salad which tend to leave a residue. The diet should mainly consist of dairy produce (milk, eggs, butter, cream, cheese) for its calcium content. Well-cooked milk puddings and good home-made soups are also excellent. There is a theoretical objection to these high-fat diets on the ground that the lacteals may be blocked, but in practice, unless the stools do become fatty there is no need to reduce the fat content of the diet. Except for vitamins drug treatment plays a minor part. Preparations containing vitamins A, D and C are especially indicated. Salts of calcium may be used in the healing stages to ensure that there is sufficient of this mineral to effect calcification of the glandular lesions. Useful preparations are:—dicalcium phosphate 20 to 30 grains t.d.s., calcivitan (Richter) one tablespoon daily and calcydic (A. and H.) one or two teaspoonfuls. These preparations should be taken before meals. Liquid paraffin should be given to regulate the bowels and in obstinate cases warm olive-oil enemas may be necessary.

The question of surgical treatment must be briefly discussed. The resemblance of appendicitis to inflamed mesenteric glands is often close and some hold the view that the appendix should be removed in all cases. This is probably too radical, but if the pain is severe, causing vomiting and associated with loss of weight, then laparotomy may be called for, with removal of the appendix and any other obvious focus, such as a tuberculous Fallopian tube. In the ascitic form of tuberculous peritonitis a laparotomy can be employed to evacuate a fluid of low bactericidal power in the hope that it will be replaced temporarily by a serous effusion of higher bactericidal power. It is undoubtedly true that many children with free fluid show improvement from the time of the laparotomy, but on the other hand it is just in the early ascitic type of the disease that general hygienic measures secure the best results. One advantage of laparotomy is that it does enable the diagnosis to be established beyond all shadow of doubt and it also confirms an opportunity for removal of the appendix which some authorities regard as the essential primary focus in almost all forms of abdominal tuberculosis. In any case surgical intervention must be followed by rest under good hygienic conditions, a generous diet and, if available, sunlight. It is possible that the after-treatment is more responsible for good results than the surgical episode.

Bug Destruction

(From the *British Medical Journal*, 22nd January, 1938, Vol. I, p. 177)

THE bed bug is not normally a vector of communicable disease, but everything else that can be said of it in its human relations is by way of dispraise. By means of its powerful beak it pierces the skin of man, raising a painful red blotch surrounded by papules. By means of a pair of glands situated in its thorax it diffuses a repulsive odour. It is a pest in houses, lying concealed by day in cracks and crevices and emerging at night to suck the blood of sleepers. The presence of bugs in dwellings, besides being vexatious to tenants, has also come to carry some suggestion of a social stigma, and quite a range of substances of varying degrees of activity has been employed from time to time for their extirpation. Turpentine and scalding water, corrosive sublimate and painters' blowlamps, naphthalene and sulphur dioxide have all been applied without conspicuous success, and so recourse has been had, as a last resort, to gaseous hydrocyanic acid.

While fumigation with hydrocyanic acid has been found quite effective for the destruction of bugs, the method completely fails to conform to the requirement that a convenient disinfectant should not be unreasonably toxic to man, by attacking operators or dwellers in adjacent premises or by leaking out of stuffed furniture after the fumigation is over. When the acid is employed for killing rats in the holds of ships the whole procedure can be kept under strict control, but its routine use about people's homes for the destruction of insects, even granted that bugs are a pest and that all precautions are taken, as we believe they are, conveys to the mind a suggestion of incongruity between the risks taken and the results achieved. A

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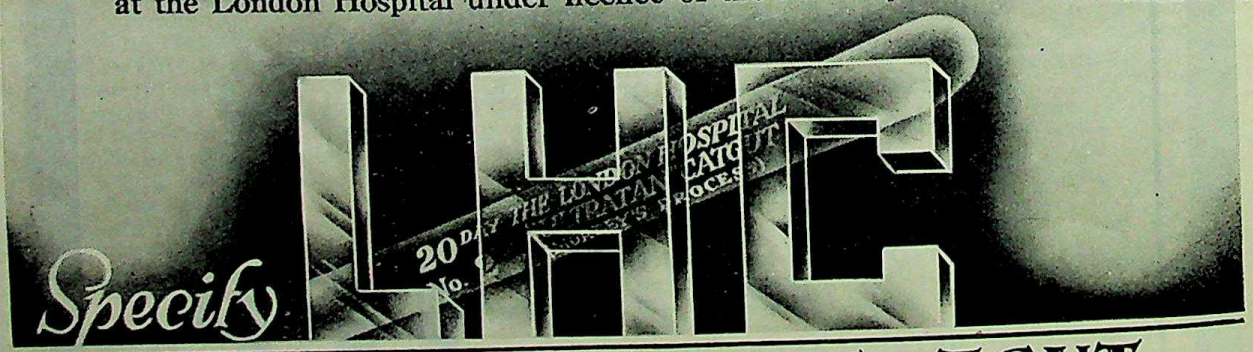

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report in this number of the *Journal* suggests that the vapour of heavy naphtha may be found on extended trial to possess a bug-destroying power which is for practical purposes equal to that of hydrocyanic acid while at the same time non-toxic to man. The method recommended is to spray the naphtha on the surfaces to be disinfected and also on sheets of Egyptian cotton hung on frames of electrical conduit tubing three inches from the walls, with a view to producing a concentration of naphtha vapour in the air of the room. The room is then sealed and kept sealed for twenty-four hours. Just before sealing up the room a clockwork-driven delayed-action naphtha sprinkler is placed in position and set to deliver a reinforcing charge of naphtha from nine to eleven hours later. This is done in order to ensure that naphtha vapour remains in the air in lethal concentration. When the room is unsealed all bugs should be dead. Lethal concentrations of naphtha for bugs are from 0.15 per cent upwards, with twenty-four hours' exposure. It is important that the room temperature should not fall below 50°F., and preferably that it should be 60°F. or over. Owing to the rapid escape of heat from houses, rooms for disinfection in winter should be raised to 80°F. before the process begins. As the flash point of the naphtha is 105°F. no naked lights or tobacco smoking can be permitted. The only instance of disability among the workmen employed on the tests was one case of irritation of the skin of the hand, which readily yielded to lanoline. With suitable modifications the method can be applied to empty or furnished rooms or vans containing furniture.

On weighing up the results of the tests which have been carried out the impression is distinctly favourable to the tentative claims made on behalf of heavy naphtha. The reporters have rendered a useful service by their work with the substance. If bugs can be killed with ease and precision by its means there will be no need for operators or others to incur the major hazard of hydrocyanic acid.

Reviews

DIE MALARIA: EINE EINFÜHRUNG IN IHRE KLINIK, PARASITOLOGIE UND BEKÄMPFUNG. Von:—Professor B. Nocht, Dr.Med., Dr.Med., H. C. Hamberg, und Professor M. Mayer, Dr.Med., Dr.Med. vet H. C. Hamburg. 1936. Verlag von Julius Springer, Berlin. Pp. 172. Mit 24 Abbildungen und 2 Farbigen Tafeln. Price, RM: 15,60.

MALARIA: A HANDBOOK OF TREATMENT, PARASITOLOGY AND PREVENTION.—By Bernard Nocht, M.D., and Martin Mayer, M.D. 1937. John Bale, London. Pp. viii plus 196. Illustrated. Price, 10s. 6d.

THE first German edition of this work was published in 1918, and, though it was well received by the medical profession, it was the second edition of 1936 that attracted more universal attention, and those who were unable to get the best out of the book on account of their limited knowledge of the language have looked forward to the inevitable English translation ever since.

Bernard Nocht, the 'grand old man' of tropical medicine who has recently celebrated his 80th birthday, was for many years director of the Tropical Diseases Institute at Hamburg, and has always been especially interested in malaria and blackwater fever; his views on the subject have always been sound and have carried considerable weight everywhere. Similarly, Martin Mayer is well known for his work in the tropical field and as a teacher at the Hamburg institute, he has contributed much to our knowledge of both malaria and leishmaniasis. Much was therefore expected from their collaboration and we believe that few readers will be disappointed.

Although the book is a small one, the subject has been dealt with comprehensively and all aspects of the malaria problem are touched upon, from the history of the disease to its control by the destruction of larvæ and adult mosquitoes. Some of the major section headings are 'clinical picture', 'treatment', 'blackwater fever', 'induced malaria therapy', 'medicinal individual prophylaxis', 'determination of malaria index of population', 'technique of blood examination', 'zoology' and 'the carriers of malaria'.

The introduction of the synthetic anti-malarials has of course entirely revolutionized treatment and the section in this edition bears little resemblance to that in the original 1918 edition. Quinine, atebrin, plasmochin and the combinations of these drugs, more especially quino-plasmochin, are discussed separately. The place of arsenic also is considered. A short summary of the various methods of treatment is given: this makes comparison of the different drugs easy. It is, however, a little unfair to quinine to recommend the prolonged 6-weeks' course of this drug and only a 7-days' course of atebrin. The general opinion to-day is, in any case, against the prolonged administration of any anti-malarial drug, except in cases where reinfection is likely, or as a prophylactic measure.

The sections on technique should be very helpful and there are some quite useful coloured plates.

There is a formidable list of errata in the English edition and many of the page headings are singularly inappropriate, *e.g.*, 'anæmia' on page 83 and 'blood regeneration' on page 125: the printer appears to have adopted the 'shut-eyes-and-pin' method for making his choice for these page headings.

This book is a very welcome addition to the literature on malaria and we can strongly recommend it to all engaged in the struggle against this disease, whether they be sanitarians or physicians.

L. E. N.

THE PRACTITIONERS' LIBRARY OF MEDICINE AND SURGERY. VOLUME XIII, SUPPLEMENT AND INDEX. 1938. D. Appleton-Century Company, Inc., New York and London. Pp. xiii plus 1161. Illustrated. Complete in 12 volumes and general index. Sold in complete sets only. Rs. 485. Only available from Messrs. Butterworth and Company (India), Limited, Calcutta

SUBSCRIBERS to this very important American publication will feel that they are getting something for nothing. They were promised twelve volumes and an index; in the present volume they have been given an index of 350 pages and in addition 808 pages of supplement. The first volume of the series bore the date of 1932 and in the medical world things have happened during the intervening years; many of these happenings are recorded in this supplementary volume, which is in fact a kind of medical quinquennial. Even in a well-planned work omissions are inevitable and such omissions as were discovered have been made good also in the present volume.

There is an excellent account of calcinosis with a number of good illustrations: this is an example of an earlier omission. Another example is sandfly fever: the account given of this is one of the best in medical literature. There is additional matter on the typhus group of fevers. The classification given is dependent on the Weil-Felix reaction; this is a very unsatisfactory classification as it takes us no nearer the solution of the ætiology of the members of this group in which it is obscure, as for example, Indian tropical typhus. The Weil-Felix reaction is not a truly specific reaction, but is due to a curious accident in the similarity to one another of the antigenic structure of two genetically unrelated organisms. Further, we cannot agree that

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all the types included in the third group of this classification give a positive Weil-Felix reaction to all three strains.

The writer does not seem to have made any reference to the initial lesion, the *tâche noire*, of eruptive Mediterranean fever, also called *fièvre boutonneuse*, a name which itself suggests more than the ordinary macular typhus rash.

There is a useful article on habitual hyperthermia: in a country where the word *fever* is used as a synonym for *illness*, it is important to realize that about one per cent of individuals have a normal temperature as high as 99.7°F.; remembering this simple fact may save many patients being torn to pieces in a search for a supposed septic focus and in the process losing their teeth, tonsils and even cervix uteri, or being poisoned with overdoses of carbarsone, sulphanilamide, or quinine, when a better result would have been achieved by removing their clinical thermometers.

There are articles on mandelic acid, in urinary sepsis, on diabetes, protamine insulin, and ergotamine in migraine, but the only reference in the index (which incidentally is not above criticism) to sulphanilamide is to 'sulfanilamide poisoning'. The subject of sexual impotence in men has been given a number of pages; the writer explodes a number of fallacies.

A single volume of this work weighs 6½ pounds: we were therefore looking forward to a lighter general index, but the present volume is probably the heaviest of the thirteen and it needs quite strong wrists to remove it from the shelf; though it may sound ungrateful, when the publishers have added this excellent supplement without adding to the price of the whole series, we are sorry that the general index could not have been bound separately.

It is a little late to suggest to our readers that they now become subscribers to this very valuable work, but it is quite possible that there are still some sets available. We can congratulate the editors, the contributors, and the publishers on the successful achievement of a very ambitious undertaking.

PHYSIOLOGICAL CHEMISTRY OF THE BILE.—By H. Sobotka. 1937. Baillière, Tindall and Cox, London. Pp. xii plus 202. Illustrated. Price, 13s. 6d.

IN this volume the author has endeavoured to gather together from the voluminous literature, the data with regard to the physiological, pharmacological and pathological aspects of bile acids and other chemical constituents of bile. Bile is a highly complex fluid and the physiological significance of many of its constituents is unknown. In order to understand the function of an organ it is essential to have a knowledge of its structure. The author therefore follows the plan of preceding the account of physiology by a short description of anatomy of the biliary tract, its histology and the cytology of the bile. In the chapters which follow, the biochemistry of bile and its various constituents, the influence of the various chemical, physical and biological factors on the biliary secretion and the effects of bile acids on the organism are dealt with in detail. The author has made brief comments himself in many places with a view to bringing out the significance of the liver as a secretory organ, whose physiological activities are very important in the economy of the body.

The book is well written and will be of great interest to those interested in this subject. Its value is greatly enhanced by a very comprehensive and well-arranged bibliography and authors' index which run to 50 pages.

R. N. C.

PRACTICAL TALKS ON KIDNEY DISEASE.—By E. Weiss, M.D. Baillière, Tindall and Cox, London. Pp. xii plus 176. Illustrated. Price, 9s.

THIS volume contains a critical though concise survey of our knowledge of kidney disease, emphasizing the practical aspects of this important subject. Tribute is paid to the monumental work of Richard Bright and the author has referred to many of the well-known recent contributions. In the first few chapters the physiology and pathology of the kidneys, and the various types of nephritis are dealt with in detail, and valuable hints are given with regard to treatment. The author emphasizes the inadequacy of the clinical significance of the term 'nephrosis' and leans towards the conception that nephrosis is a term which should designate a degenerative lesion confined to the kidney tubules. Dealing with the relation of hypertensive vascular disease to kidney disease, the author considers that arteriosclerosis with renal manifestations can best be explained by assuming that arteriolar involvement ante-dates the renal changes and that nephritis is either a result of the vascular changes or due to the same cause which produces an abnormal condition of the arterioles. Hypertensive vascular disease is said to be responsible for 25 per cent of all deaths of persons over 50 years of age. The cause of essential hypertension is admitted to be unknown, but, in its treatment, a regime of reduction of proteins, no tobacco, rest and no drugs are suggested.

The book will certainly prove very useful to the medical profession as it gives a clear conception of kidney disease and treatment of hypertension.

R. N. C.

THE COLLAPSE THERAPY OF PULMONARY TUBERCULOSIS.—By John Alexander, B.S., M.A., M.D., F.A.C.S. 1937. Baillière, Tindall and Cox, London. Pp. xiii plus 705 with 367 figures. Price, 67s. 6d.

THE collapse therapy of pulmonary tuberculosis constitutes the greatest advance in recent years for cases in which the course of the disease is progressive in spite of ordinary treatment. The choice of the most suitable of the available operations for a particular patient presents however a complex problem which can only be solved by a sound knowledge of the action, advantages, and disadvantages of each operation.

Dr. Alexander's book seems to fulfil the purpose. It is based upon an experience with the surgical treatment of about eighteen hundred patients and various observations by the author and other contributors. In addition to the value of roentgenograms, the importance of due consideration of the patient's age, general and cardio-respiratory condition, pulmonary lesion and many other variable factors has been stressed as essential before a decision as to the proper form of treatment can be made. Ten different operations which may be used singly or in various combinations have been described; of these pneumothorax, phrenic paralysis and thoracoplasty are most often practised, while operations like scalenectomy, pneumolysis, cavity drainage, etc., are used to extend the benefit of collapse therapy. The operative technique and pre- and post-operative management have been fully described, the good and bad points of each procedure pointed out, and the inter-relationships of various operations mentioned. The concluding remarks in almost every section are very useful.

Two chapters on the physiological principles and the pathology of pulmonary collapse have been contributed by Dr. Pinner, two chapters on pneumothorax by Dr. Branwell, and a chapter on oleothorax by Dr. Howlett, Jr. The last two chapters of the book deal with tuberculous empyema and tuberculosis of the thoracic wall.

The book is rather too big for its subject, and, as is not unusual in books written by different authors, there is a certain amount of overlapping, as for instance the definition of collapse therapy and some descriptions have been repeated in several places, though in a different way.

The illustrations are profuse and vivid. The photographs of eighteen pioneers in collapse therapy are of great historical interest. A bibliography of 1,342 references has been given at the end of the book. The get-up of the volume is excellent. The book will be useful to those interested in the surgery of pulmonary tuberculosis.

R. C.

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MODERN ADVANCES FOR RURAL PRACTICE.—By P. C. Dutta, M.B. (Cal.), F.R.C.S. (Edin.), D.G.O. (Dub.), Capt., I.M.S. 1938. Messrs. Butterworth and Company (India), Limited, Calcutta. Pp. 174. Illustrated. Price, Rs. 3-8.

THE book is primarily meant for the rural practitioners but the author hopes it will prove equally useful to the average general practitioner in India, who has not the modern methods of diagnosis and treatment at his disposal. In compiling the book he has endeavoured, as far as possible, to keep strictly to the essentials of treatment, avoiding unnecessary descriptions and details for which the busy practitioners have no time. The diseases have been arranged alphabetically to facilitate easy reference.

One fails to see what constitutes in this book a special feature for rural practice. It deals with agranulocytosis, myasthenia gravis and Addison's disease, but not the diseases or conditions such as tropical splenomegaly, hepatic cirrhosis, cancrum oris, ascaris infection, heat fever, etc., which the practitioner will encounter daily.

The treatment advocated for certain conditions is difficult to justify, for instance, injections of quinine hydrochloride in blackwater fever and of liver extract in smallpox, the administration of a liberal diet in hæmatemesis, and the application of cignolin in oriental sore. There is confusion in the description of the anæmias, and both sprue and cerebro-spinal fever have been dealt with very inadequately.

On the whole the book will be found very useful, as it contains much valuable information. The illustrations of the hand infections, tables of infant feeding and food values are useful.

R. C.

FRACTURES AND DISLOCATIONS FOR PRACTITIONERS.—By E. O. Geckeler, M.D. 1937. Baillière, Tindall and Cox, London. Pp. x plus 252, with 213 illustrations. Price, 18s.

IT has to be admitted that there is no dearth of excellent textbooks on the subject of fractures and dislocations. A newcomer is, therefore, liable to meet with a critical review unless it has some special features to offer. This book, which has been written for the benefit of the general practitioner, aims at presenting the surgery of fractures and dislocations in a condensed form without the omission of important details. On account of the increasing frequency and severity of street accidents, the responsibility of general practitioners is considerably increased, since they have to undertake efficient first aid if not the entire treatment of these cases. The object of the author, therefore, is a laudable one.

This book consists of two parts of which the first, comprising 19 chapters and 202 pages, deals with the subject of fractures. The smaller and second part, dealing with dislocations, consists of only 46 pages and 13 chapters. The consideration of the subject-matter will be found satisfactory on the whole, but there are some shortcomings which must be mentioned. With regard to skeletal traction, there are full descriptions of the archaic methods for the insertion of Steinmann's pin and the ice-tongs. There is only a brief reference to Kirschner's wire and it has not been favoured even with a single illustration, although there are 213 pictures in the book. The requisition of the surgeon's heel, for the reduction of certain fractures and dislocations, may be regarded as a thing of the past. There are at least three pictures depicting this method. We are also in doubt if it is right to expect the general practitioner to undertake the operative treatment of patella fractures or the insertion of the Smith-Petersen nail in fractures of the neck of the femur.

This book is not without its merits. The importance of after-care for restoration of function has been well emphasized. The reproduction of the *x*-ray plates is very good and the techniques of manipulation are also clearly set out. We hope that this book will be of some value to the general practitioner. The printing and get-up are excellent and there is a useful index.

P. N. R.

THE THERAPEUTIC PROBLEM IN BOWEL OBSTRUCTIONS: A PHYSIOLOGICAL AND CLINICAL CONSIDERATION.—By O. H. Wangensteen, B.A., M.D., Ph.D. 1937. Baillière, Tindall and Cox, London. Pp. xxi plus 360, with 90 figures. Price, 27s.

THIS book forms a well-balanced contribution to surgical literature, bringing together for the first time the voluminous but widely-scattered published work on a subject in which advances of knowledge are fast being contributed from all parts of the world.

There are three parts to the book. The first, embodying as it does the Samuel D. Gross Prize Essay for 1935 of the Philadelphia Academy of Surgery, sets a very high standard which is sustained throughout the remainder of the book. The basis of the work is the experimental work carried out by Wangensteen himself, either original or in confirmation of the work of some other experimentalist. The approach to each point or problem is always physiological. In spite of the highly scientific nature of the work, the facts are presented in a concise and eminently readable manner.

It would be quite impossible to pick out any one part of this work as being of greater note or value than the remainder.

Surgeons young and old should welcome this work from the laboratory of a well-known American authority on bowel obstruction. There are chapters which should be read by house surgeons and senior students. Those interested in the problem of bowel obstruction will doubtless equip themselves with this book, but it should be read by all interested in the advance of surgery.

The author and the publishers are to be congratulated on the excellence of their production.

A. T. A.

THE PROGNOSIS IN SCHIZOPHRENIA AND THE FACTORS INFLUENCING THE COURSE OF THE DISEASE. A KATAMNESTIC STUDY, INCLUDING INDIVIDUAL RE-EXAMINATION IN 1936 WITH SOME CONSIDERATIONS REGARDING DIAGNOSIS, PATHOGENESIS AND THERAPY.—By G. Langfeldt, M.D. 1937. Oxford University Press, London. Humphrey Milford. Pp. 228. Obtainable from the Oxford University Press, Bombay and Calcutta. Price, 12s.

THIS brochure of Dr. Langfeldt is a very important contribution to the recent literature on schizophrenia, a disorder which is now receiving more and more attention the world over. As the title of the brochure proclaims, the primary object of the author is to elucidate the question of prognosis, but he has a good deal to say besides about the pre-psychotic and other factors which may be considered likely to influence the prognosis. First and foremost, Dr. Langfeldt is convinced that many of the complaints usually described as schizophrenia represent a congeries of diseases differing widely in their pathogenesis.

He divides these so-called schizophrenias into two main divisions, the typical schizophrenias and what he terms atypical schizophreniform psychoses. The first group, which Dr. Langfeldt would prefer to see called schizophrenic process psychoses, is characterized by very pronounced symptoms and by a poor prognosis and may be conveniently considered under three sub-heads namely: (1) the primary persecution dementia, (2) a type characterized by a loss of the sense of reality with delusions of reference, and (3) the typical katonic form of schizophrenia. Transitional forms do occur. In regard to the pathogenesis of these three groups, the author believes that the morbidity of the first type lies in the phylogenetically *youngest* parts of the brain while the morbidity of the other two forms may be sought in the phylogenetically older parts of the brain. Indeed, the typical katatonia is probably associated with disturbances in the middle brain.

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The author's view of the localization of the schizophrenias in different cortical and subcortical strata is supported, *inter alia*, by his observations during insulin treatment. For example, he states that insulin cannot effect a cure in the typical schizophrenias, although 70 per cent cures are claimed among the atypical schizophrenias, disorders which will as frequently recover in 6 or 12 months without this dangerous treatment.

With regard to the factors influencing the course of the disease, the author maintains that the inheritance of insanity does not seem to have any decisive influence on the prognosis. Indeed, it seems that the occurrence of insanity in direct ascending or collateral lines may be quite a favourable factor. As regards bodily constitution and temperament, a pronounced schizothymic or schizoid temperament seems to be a prognostically unfavourable factor, whereas the so-called pyknic constitution is favourable from the standpoint of prognosis.

In respect to the intellectual ability of patients, the author has observed that those who had good school records are more liable to form antistic hyper-æsthetic reactions. It is a great pity that this extremely interesting and important piece of work should be marred in places by the mis-spelling of English terms. For example, such words as 'subcorticale', 'manodepressive',, 'stomache', 'schizotyme', 'cyklotyme', and so on. The author uses the term 'delirium' in the French sense of the word *délire* and the word 'casuistry' to denote the expression 'case history'.

O. B-H.

PAPERS ON PSYCHO-ANALYSIS.—By E. Jones, M.D., M.R.C.P. (Lond.). Fourth Edition. 1938. Baillière, Tindall and Cox, London. Pp. x plus 643. Price, 25s.

EVERYONE who takes an interest in psycho-analysis will welcome this latest edition of Dr. Ernest Jones' masterpiece. As he states in the preface, this book started twenty-six years ago and has since become 'a slow-moving picture of the development of psycho-analysis'. The present volume has twelve new essays added to it while twenty older ones have been taken out to make room for them. Of the new additions, Dr. Jones' paper on 'jealousy' is one of the most striking. Besides an unusually good index, the book contains a copious glossary. It is to be hoped that this new edition will stimulate Indians in psycho-analysis for up to the present practitioners and students of psycho-analysis are almost entirely Bengalees.

O. B-H.

THEORETICAL PRINCIPLES OF ROENTGEN THERAPY.—Edited by E. A. Pohle, M.D., Ph.D., F.A.C.R. 1938. Henry Kimpton, London. Pp. 271. Illustrated with 132 engravings. Price, 21s.

THIS volume on the theoretical principles of roentgen therapy, which is going to be followed by a second on the more clinical aspects of radiation therapy, bears the stamp of authority. Each section is written by an acknowledged leader in the particular field covered, the contributors being:—R. R. Newell, M.D., Professor of Medicine (Radiology), in the Stanford University Medical School, San Francisco, California; Ernst A. Pohle, M.D., PH.D., Professor of Radiology, in the University of Wisconsin, Madison, Wis.; K. Wilhelm Stenstrom, PH.D., Professor of Biophysics in the University of Minnesota Medical School, Minneapolis, Minn.; Lauriston S. Taylor, PH.D., Physicist, Bureau of Standards, Washington, D.C.; Francis Carter Wood, M.D., Director, Institute of Cancer Research, in the Columbia University, New York City.

The work is divided into five chapters. The first of these on the physics of the roentgen ray, is written by Dr. K. W. Stenstrom. This section is extremely concise, and forms lucid exposition of a difficult subject. The measurement of *x*-radiation has become increasingly accurate within the last few years, and a description of the various methods will be easily understood by anybody with even a meagre knowledge of physics.

The second chapter on apparatus is dealt with by Dr. R. R. Newell, and contains descriptions including the most modern high voltage plants.

Dosimetry is dealt with by Drs. Lauriston Taylor and E. A. Pohle, who have dealt with the subject in a thoroughly practical manner.

The fourth and extremely important chapter by Dr. F. C. Wood deals with radiobiology and radiopathology. This is by a long way the best account within the compass that has appeared on this rapidly changing subject. The last chapter by Dr. Lauriston Taylor deals with protection from roentgen rays.

This work will be welcomed by radiologist and clinician alike.

G. G.

EYE STRAIN AND CONVERGENCE.—By N. A. Stutterheim, M.D. (Rand.). 1937. H. K. Lewis and Company, Limited, London. Pp. x plus 89. Price, 7s. 6d.

THIS monograph deals with the author's views in the ætiology and treatment of 'eye strain'. The exact pathology of 'eye strain' is still unknown, but the author's opinion is that the cause is due to weakness of convergence. He points out that 'errors of refraction' may implicate eye strain, but they are never the true cause of it. Many people without appreciable ametropia have eye strain, and often in a severe form, and people with high ametropia as a rule have very little eye strain. Eye strain is certainly not due to weakness of the eye, or eyes, and is prevalent in visually strong, healthy, nearly emmetropic, slight hypermetropic, or slightly astigmatic eyes.

The author discusses defective power of convergence from the anatomical, physiological, clinical and therapeutic aspects. He makes out a good case that this is its principal cause and gives a lucid description of his methods of treatment and the very satisfactory results he has obtained. He pleads that schools of ophthalmology should return to physiological methods in the treatment of eye strain and that it can be cured by kinetic treatment which is designed to unfold the power of convergence. The book is a valuable contribution to ophthalmic literature, will be read with great interest and will be found most useful to ophthalmic surgeons practising in India.

E. O'G. K.

A PRACTICAL GUIDE IN THE TREATMENT OF EYE DISEASES (OPERATIVE AND MEDICINAL).—By K. Krishna Murty. 1937. Published by Dr. Krishna Murty, L. N. Hospital, Chodavaram, South India. Pp. 86. Illustrated. Price, Rs. 2.

THIS small book is written with a view to engaging the attention of general medical practitioners to face the problem of ever-increasing blindness in India. The author is not successful in achieving that end in view, with his limited resources.

The book is divided mainly into two portions, the first part dealing with the operative treatment and the other with the therapeutics of the various eye diseases. Some of the common operations on the eyes are described elaborately, mentioning the common complications which may arise during the course of operations. Synopses for the treatment of the ocular diseases are considered to be of little practical value to general practitioners or post-graduates.

A number of printing mistakes have crept in. The general get-up of the book should be improved.

E. O'G. K.

OCCUPATIONAL THERAPY: AN ADDENDUM TO THE HANDBOOK FOR MENTAL NURSES. 1938. Published for the Royal Medico-Psychological Association. Baillière, Tindall and Cox, London. Pp. 16. Price, 6d.

THIS brochure is exceedingly concise and yet fully informative in regard to the value of occupation as a

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therapeutic agent for persons suffering from mental disorders. For some reason or another, it does not seem to have occurred to the author that occupation is potent as regards the therapy of any illness, a fact long ago discovered and put into practice in the U. S. A., where an occupational therapy association has existed for many years, thanks to the unremitting enthusiasm of Mr. E. Slagle, its president.

On page 11 the author gives two lists of occupations, one set for men and another for women. There is no point at all in this. Some women take very kindly to work usually allotted to men, and, perhaps what is even more unusual, men often like to occupy themselves with work ordinarily undertaken by women. The psychological basis of allotting occupation to a mentally disordered patient should be, as far as possible, in some way related to the psychogenesis of the disorder. It is a great mistake to insist, as the author suggests, that what patients make should conform to normal standards. Many paranoiacs will get deeply engrossed in the construction of all sorts of more-or-less useless 'contraptions'. It is fundamentally wrong to urge them to do otherwise. Many readers of this brochure are likely to imagine that William Tuke, whom the author rightly cites as a reformer in the care and treatment of the insane, was a doctor. He was not: He was a tea-broker of the Society of Friends.

O. B-H.

Abstracts from Reports

ANNUAL REPORT OF THE CHEMICAL EXAMINER'S DEPARTMENT, MADRAS, FOR THE YEAR 1936

THE total work of the department does not show any appreciable decrease as compared with previous years in spite of the transfer of a portion of this Presidency to the new Orissa Province.

HUMAN POISONING CASES

The total number of human poisoning cases examined during the year was 363 with 2,090 articles as against 380 cases with 2,341 articles in 1935 and 327 cases with 1,995 articles during 1934.

Poison was detected in 185 cases or 51 per cent.

The nature of the poisons detected is shown in the following table :—

Poisons detected

Inorganic poisons

	Cases
Arsenic	12
Arsenic and copper	1
Arsenic and mercury	2
Arsenic, copper, mercury and aconitine	1
Copper sulphate	12
Cyanide	7
Cyanide and alcohol	1
Mercury	9
Mercury and copper	2
Mercury and oleander	1
Mercury and unidentified	1
Nitric acid or nitrates	9
Potassium or sodium nitrite	2
Potassium permanganate	1
Sulphuric acid	1
Sulphuric acid and nitric acid	1
Total	63

Organic poisons

	Cases
Aconitine	5
Alcohol	6
Bamboo shoots	1
Cresols	2
Croton seeds	1
Gloriosa superba	4
Jatropha curcas	1
Kerosene oil	2
Madar	14
Datura or mydriatic alkaloid	11
Nux vomica or its alkaloids	4
Oduvan	2
Oleander	28
Opium	31
Phenol and aconitine	1
Turpentine	1
Unidentified	8
Total	122

Opium heads the list with 31 cases closely followed by oleander with 28 cases. There has been a decrease in cases of datura or mydriatic alkaloid poisoning, 11 cases in 1936 as against 20 cases in 1935. There has been an increase in cases of poisoning by madar juice —14 cases in 1936 as against five cases in 1935. In eight cases the nature of the organic poison could not be determined.

The following cases are selected as of interest :—

Arsenic.—(1) A man had been living as a parasite on his paternal uncle for several years. One morning he went to his uncle's house and had a breakfast of *iddlies* (rice cakes) and coffee served by his uncle's concubine. He noticed a peculiar taste in the coffee and asked her about it. The woman told him that it was not coffee but tea and pressed him to drink it all. After drinking the liquid he saw a white deposit at the bottom of the tumbler. He was seized with pain in the stomach and had vomiting and purging. He was removed to hospital where he developed cramps in both legs and suppression of urine, became unconscious and died. Police enquiries disclosed that the woman had purchased *Pashanam* (white arsenic) from a local quack stating that she wanted it for the destruction of rats. We found in the viscera of the deceased arsenic equivalent to about one and two-thirds grains of white arsenic. The remnants of the poison from which the *Pashanam* had been sold were found to be white arsenic weighing about 944 grains. The woman was convicted and sentenced to transportation for life, the lesser penalty being awarded as she had presumably done what she did with the idea that she was releasing her paramour from the clutches of the deceased.

(2) The following is a case of suicide with arsenic. A young man received a telegram that an important relative of his in a high position in life was dead. The young man was admitted to hospital with symptoms of poisoning and there he stated that he had swallowed white arsenic about the size of a hen's egg. He died in hospital. In his stomach contents was found arsenic equivalent to about nine-tenths of a grain of white arsenic. The viscera were not sent to us, probably as it was an obvious case of arsenic poisoning.

(3) A man planned to inherit his brother's property by getting rid of his brother's two sons. He prepared two betel *killies* (Telugu name for packets of areca nuts and lime rolled in betel leaf) and gave one *killie* to each of his nephews. One boy ate it and began to vomit. The other boy passed on the gift to a boy playmate who ate it and began to vomit too. Both the victims were removed to hospital where they recovered after treatment. Arsenic was detected in minute quantities in the vomited matter of each of the victims and in the urine of one of them.

(4) A man went to a village where his wife had been staying, in order to take her home to his own village. At the home of his wife's relations he had a breakfast of cumbu bread and curd after which he had vomiting, purging and convulsions and died in about fourteen hours. The body was quietly buried by

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the wife's relations. A cousin of the deceased grew suspicious and reported the matter to the police, as a result of which the body was exhumed three days after burial. The viscera were sent and they disclosed arsenic equivalent to about two and one-fifth grains of white arsenic. The remnants of the suspected poison seized by the police were found to be white arsenic weighing about 31 grains. One of the items seized from a shop in a neighbouring town where the purchase had been made was also found to be white arsenic weighing about 2,115 grains.

(5) It is very rarely that the secret seller of poison is detected. A man was found in a collapsed condition on the road-side of a town and was removed by the local scavengers to the hospital. Before the man died he confessed to having eaten, with a suicidal intent, white arsenic purchased from a particular person in the town. The vomit and the viscera showed about two and two-fifths grains of white arsenic. The poison seller's shop was searched by the police and among the several poisons found was a quantity of white arsenic. The seller was convicted for breach of the Poisons Act as he possessed no licence for the sale of poisons and was sentenced to pay a fine of Rs. 100 or in default to undergo rigorous imprisonment for three weeks.

Mercury.—(1) A woman after preparing food fed her children and went to fetch water. After returning home she began to eat but she did not relish the food. She vomited and the vomiting persisted for a long time. She remembered that a boy whom she had seen loitering about the house when she left had vanished by the time she returned. She complained to the police who sent us the remnants of the food for examination. We detected in the food about one grain of corrosive sublimate.

(2) Two persons were given, probably as a practical joke, a confection of jaggery and gingelly seeds by three persons residing in the same village. The victims had vomiting—it is not stated whether they had purging—and recovered. We detected about 21 grains of colomel in the confection and minute quantities of mercury in the vomited matter.

(3) A woman complained before a magistrate that she had been seduced by a man and that, as she was pregnant, her paramour intending to cause abortion tried to force her to swallow three pills. She pushed his hand away and one of the pills dropped to the ground. This pill was picked up and produced in court. About two grains of corrosive sublimate were detected in the pill. As there were no reliable witnesses to substantiate the story of the complainant, the case was dismissed.

Copper.—Of the twelve cases of copper poisoning ten were cases of intended suicide. There were two deaths. In one of the fatal cases was found copper equivalent to about thirty grains of crystalline copper sulphate in the stomach, equivalent to about two-thirds of a grain of crystalline copper sulphate in the intestines and equivalent to about one grain and a half of crystalline copper sulphate in the liver and one kidney. In the other fatal case was found copper equivalent to about one-fourth grain of crystalline copper sulphate in the stomach, equivalent to about two and one-fourth grains of crystalline copper sulphate in the liver, equivalent to about one-fourth grain of crystalline copper sulphate in the kidney, equivalent to about one-fifth grain of crystalline copper sulphate in the intestines and equivalent to about one-fiftieth of a grain of crystalline copper sulphate in the urine.

The following are the details of the non-suicidal cases :—

(1) A sandwich known as *karjikaya* was offered to a young woman to eat. She tasted it and found it bitter. She produced the uneaten portion before the village magistrate and the police sent it in. Copper equivalent to about two grains of crystalline copper sulphate was found in it but no other poison.

(2) A young man, while squatting and urinating according to custom on the side of the street, found in front of him a blue crystalline lump which he thought was a coloured sweet. He munched it and, finding the taste disagreeable, swallowed it instead of spitting it out. He began to vomit. He called his relations and after telling them what he had done fell unconscious. He was removed to hospital where he recovered after treatment. One of his vomits in the hospital showed copper equivalent to about three-fourths of a grain of crystalline copper sulphate.

Cyanide.—(1) A house was found locked inside with a foul odour emanating from it. The door was opened by the police and two dead bodies were found inside. Cyanide in minute quantities was detected in the viscera of each of them.

(2) A father and son were found dead in a room. There was also a letter written by the father stating that he had administered poison to his son and swallowed poison himself. We found cyanide equivalent to about half a grain of potassium cyanide in the viscera of the son, and cyanide equivalent to about seven-tenths of a grain of potassium cyanide in the viscera of the father.

(3) A man swallowed some powder, walked some distance and fell down unconscious. He vomited twice or thrice and died in hospital two or three hours after swallowing the poison. The viscera and the empty paper in which the poison had been kept were sent for examination. Cyanide in minute quantities in the viscera and also in the washings of the paper was found.

Nitrite.—There were two cases of poisoning, both suicidal, from this poison during this year. Details are given below :—

(1) A young man swallowed 'nitrite of soda' which had been kept for dyeing purposes and died. The post-mortem examination revealed the presence of rigor mortis with discharge of froth from the mouth. The features were calm. The cavities of the heart were empty. The large vessels contained dark and abnormally fluid blood. The lungs were grey and emphysematous. The peritoneum, liver and pancreas were normal. The spleen was slightly enlarged and congested and the kidneys were congested. The mucous membrane of the stomach and intestines was inflamed. The brain and its membranes were congested, and the ventricles were full. The viscera but not the vomited matter were received for examination. Nitrite equivalent to about two-fifths of a grain of sodium nitrite was found.

(2) Some persons were suspected of house-breaking and theft. Two were arrested but the rest absconded. One of these absconding persons was found dead near a pond and a small packet containing a white powder was found by his side. Foam was coming out of his mouth and vomited matter of a green colour was found near the body. The post-mortem examination revealed absence of injuries. The body was decomposing but there were signs of congestion in the lungs, liver and spleen. The kidneys were normal. The peritoneum contained six ounces of dark blood-stained fluid. The mucous membrane of the stomach and intestines showed congestion with bright red patches in places. The bladder contained one ounce of urine. The powder, the viscera and the vomit were sent to us. The powder was found to be potassium nitrite weighing about 620 grains. Nitrite was found in the stomach and its contents equivalent to about four grains of potassium nitrite. The urine showed about 111 parts of potassium nitrite per million parts of urine. In the vomit was found about 144 grains of potassium nitrite.

Kerosene oil.—There were two cases of accidental poisoning of children with kerosene oil. In one case a child two years old swallowed some kerosene oil. The child was removed to hospital. At the time of admission the child was unconscious, the reflexes were present, the breathing was rapid with smell of kerosene oil in the breath, and the pulse was fair. The child recovered after the stomach was washed out. In the other case a child three years old drank some kerosene oil and was admitted into hospital conscious but coughing

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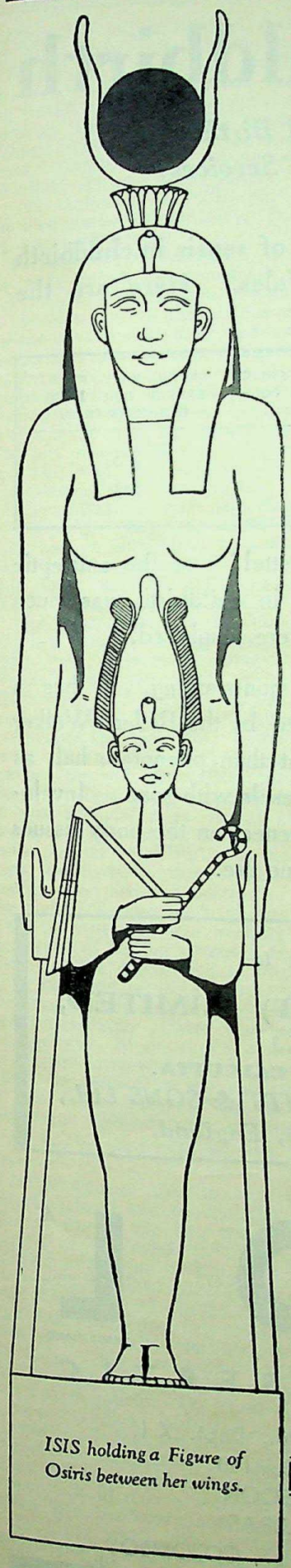

ISIS holding a Figure of Osiris between her wings.

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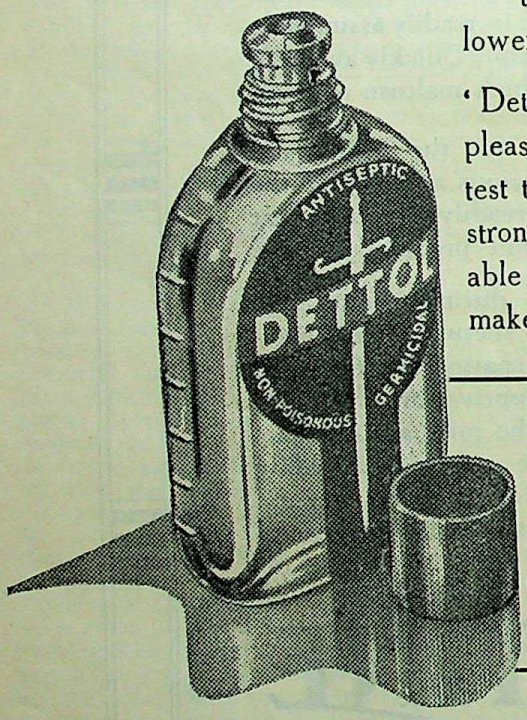
Antiseptics & Childbirth

Results of a test conducted for the National Birthday Trust Fund (for the extension of the Maternity Services) and submitted to the Ministry of Health.

In 1935 an important test in connection with the incidence of sepsis in childbirth was conducted in the Rhondda Urban District, South Wales. Here are the figures obtained:

DISINFECTANTS USED.	NUMBER OF MIDWIVES.	NUMBER OF CONFINEMENTS ATTENDED.	INCIDENCE OF SEPTIC CASES PER 1,000 CONFINEMENTS.	DEATH RATE FROM SEPSIS PER 1,000 CONFINEMENTS.
'DETTOL'	54	1,598	10·6	2·5
OTHERS	15	395	30·4	5·1



IT will be noted that, when 'Dettol' was the antiseptic used, the incidence of sepsis in childbirth was much lower than when other antiseptics were employed.

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badly. The temperature was 97°F., and pulse 140. After the stomach was washed out the child recovered.

Phenol.—(1) A woman swallowed lysol and was removed to hospital, restless and groaning and vomiting frothy material. The pulse was rapid and the temperature sub-normal. She recovered after treatment. Cresols were detected in the stomach wash and in the urine. The amount in the stomach wash was equivalent to about six grains of phenol.

(2) A man drank 'Phenyle' mistaking it for toddy. He died almost immediately. In the viscera were about 21 grains of cresols.

Phenol and aconitine.—A woman probably wanted to make doubly sure of death and swallowed carbolic acid followed by tincture of aconite. She was removed to hospital in an unconscious condition with frothing at the mouth and nose and twitchings of hands and feet. Her stomach was washed out and she recovered. In the stomach wash there was about one and one-fifth grains of phenol and also some aconitine.

Arsenic and aconitine.—A man adopted a boy and settled some property on him, against his wife's wishes. The boy who had been ill for some days died suddenly. The wife was suspected of having poisoned him. The viscera were sent in and in them arsenic was in minute quantities and on examining the viscera further aconitine was found. The general evidence at the trial was so unreliable that the judge acquitted the accused observing that the only facts beyond reasonable doubt were the death of the boy and the detection of arsenic and aconitine in his viscera.

Nux vomica or its alkaloids.—(1) An old woman and her daughter living together found they could not make both ends meet. They resolved to put an end to their lives but to do so in a systematic manner. They went to a tank and made a paste of nux vomica seeds, coconut kernel and jaggery on a stone. After swallowing the paste they bathed in the tank and went home. Both of them developed symptoms of poisoning but the old woman eventually recovered while the daughter died. Strychnine and brucine, the alkaloids of nux vomica, were found in the viscera of the deceased. The police sent two hard particles and also some portion of a fruit. By microscopic and chemical tests the particles were found to be portions of nux vomica seed and the portion of the fruit to consist of the rind, pulp and seeds of nux vomica fruit.

(2) A man who was working in a municipality was suspected of having obtained some of the poison used there for the destruction of dogs and of having mixed it in the food of his victim. The victim ate some of the food and finding it very bitter, suspected poisoning and immediately started walking towards the hospital. On the way, he developed convulsions and died about two hours later without reaching the hospital. Strychnine was present in the viscera, and in the remnants of the food. The rest of the suspected poison was strychnine hydrochloride weighing about 6½ grains.

Datura or mydriatic alkaloid.—Three cases are given below :—

(1) A woman used to visit another woman in the neighbourhood and occasionally used to dine with her. One afternoon the two were dining together. In the middle of the meal the hostess left her meal unfinished and went to the next house to borrow some curry with which to finish the meal. She returned home with the curry and ate the remainder of her meal. She soon felt giddy and became unconscious. Late in the evening she partly regained consciousness and raised an alarm. She was found by the neighbours talking incoherently, very restless and running here and there like a mad woman. The guest of the afternoon had disappeared and so had the jewels of the hostess. A mydriatic alkaloid was found in the vomit of the victim and in the remnants of the food eaten by her. Police investigation revealed that the guest had mixed a preparation of datura seeds in the food of the hostess during her temporary absence.

(2) There were frequent thefts of toddy from the toddy pots attached to the trees in a coconut grove. In order to detect the thief a servant of the lessee of the coconut grove smeared a paste of datura seeds inside one of the toddy pots on a certain evening. This particular pot was found missing from the tree the next morning. At a *mandapam* near the road a man was found drunk and unconscious with the broken toddy pot close by. The man died without regaining consciousness. A mydriatic alkaloid was found in the viscera of the deceased and in the washing of the broken pot. The servant was convicted and sentenced to pay a fine of Rs. 50 or in default to undergo rigorous imprisonment for one month.

(3) A girl had some mental disorder and a woman introduced a quack to the mother. The terms settled were payment of Rs. 4 for the cost of medicine and a reward of Rs. 10 after the patient was cured. The quack administered medicine for twenty days but the patient was not cured. The mother got her daughter treated by some other man and the second treatment showed some benefit. The quack who first treated the girl now demanded the reward claiming that the cure was really due to the delayed action of the medicine originally administered by him. The mother of the girl refused to pay the reward. The woman who introduced the quack vehemently supported the claim of the quack for the payment of the reward but in vain. The quack powdered some datura seeds, purchased a sweetmeat called *boondi* and mixed the powder with it. He gave the poisoned sweetmeat wrapped in paper to his woman friend and asked her to give it to the patient. She handed the packet to a girl with instructions to convey it to the patient. This girl handed it over to the patient who shared and ate the sweetmeat with her three younger sisters and a younger brother. All five were taken ill and were removed to the dispensary of a local doctor who informed the police. The quack was arrested and in his pocket were found a packet of powder and some seeds. A mydriatic alkaloid was found in the stomach wash of one of the victims and the powder and the seeds seized from the quack were found to be powdered datura seeds and datura seeds. The quack was sentenced to rigorous imprisonment for a period of four years but the woman was acquitted.

Madar juice.—All the fourteen cases of poisoning by madar juice were fatal. In one of these the juice was applied as an abortifacient on cotton swabs which were found, however, pushed into the abdominal cavity. Of the other thirteen cases one was homicidal and the other twelve suicidal. The information as regards symptoms and interval between poisoning and death is very scanty but may be surmised from the following particulars available in some of the cases :—

Case 1.—A woman went out and returned home at noon. She vomited three or four times and collapsed at about half past three in the afternoon. The vomit had the smell of madar juice.

Case 2.—The juice was swallowed at noon, and death occurred at 7 p.m.

Case 3.—The victim vomited in the evening and died at 8 p.m.

Case 4.—The symptoms observed were vomiting, purging, delirium and twitchings.

Case 5.—A woman was well at 11 a.m. She went out to the fields at 3 p.m. and at 5-30 p.m. news reached her son that she was dead in a field a mile from the house.

Summary of post-mortem notes.—Post-mortem notes of thirteen cases of madar juice poisoning have been received; a summary is given.

In three cases the face was bloated. In six cases there was bloody discharge from the mouth and nose. There was congestion of the lungs in eight cases, of liver in six cases, of spleen in four cases, of kidneys in seven cases and of the membranes of the brain in six cases. There was congestion of the inner surface of the stomach in four cases, of the outer surface only in three cases and of part of the inner and the outer surface in one case; the stomach and intestines were normal in the other five cases. Of the eight cases which showed congestion of the stomach, only six showed congestion of the intestines, the intestines in

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the remaining two cases being normal. The mode of death was asphyxia with gastro-intestinal irritation in six cases, asphyxia alone without any gastro-intestinal irritation in two cases, gastro-intestinal irritation alone without asphyxia in two cases and syncope without asphyxia or gastro-intestinal irritation in three cases. Four of the cases of asphyxia, one of the cases of gastro-intestinal irritation and one of the cases of syncope showed a co-existent cerebral irritation.

The history of two cases of madar juice poisoning :

(1) A man was beaten with a shoe in the course of a petty quarrel in the presence of his concubine. He took this beating to heart very seriously and said to his concubine 'Life is not worth living after being beaten with a shoe on a festive day (Adi 15th)'. He retired to a room at 5 p.m. and bolted the door. At 6-30 p.m. the concubine and others hearing his groans forced the door open. He died at 9 p.m. The viscera gave the reactions of madar juice.

(2) A woman who had been separated from her husband for several years became pregnant and was delivered of a girl baby. She called two children and giving them a coconut shell asked them to get some madar juice from a plant near by. They did so. She poured some of the juice into the mouth of the infant. About three hours later the infant was found dead. The viscera of the infant and the coconut shell were sent for examination. From the viscera and from the incrustations on the coconut shell the reactions of madar juice were obtained. The woman was sentenced to transportation for life.

Croton seeds.—A man and his brother were suspected of having stolen two bales of yarn and Rs. 200 from their co-tenant. The owner of the property enlisted the services of a travelling mendicant to discover the thief through black magic. When this mendicant wanted to perform certain rites the suspected persons objected on the score that the mendicant had been appraised of their names. This argument appealed to the villagers and the services of the mendicant were dispensed with. At this stage a quack, apparently a specialist in the art of exploiting the gullibility of credulous rustics, entered the arena. On a Friday night he held a *puja* before an idol and told the villagers that, if any of them was responsible for the theft, the wrath of the idol would be visited on the guilty person. This procedure did not produce any obvious reaction on the delinquents. The quack then distributed black pills, one pill to each of the assembled villagers. The two suspected brothers also were each given a pill. These two pills appeared to be white and quite different from the black pills. One of the two brothers protested at what appeared to him to be an obviously invidious distinction but the quack explained that the whiteness of the pills was due to accidental coating with sacred ash. As the explanation was apparently satisfactory this brother gulped down the pill. The other brother who was more cautious ate only a part of the pill and kept the other portion. The first victim who swallowed the whole pill developed purging, vomited blood and died in 20 to 24 hours, the fury of the sacred idol having been apparently let loose on him. The second victim who had swallowed only part of a pill was treated by a doctor and recovered. This doctor, suspecting poisoning, gave information to the police, who secured the uneaten portion of the pill. The viscera of the victim were sent for examination and by microscopic examination. both in the stomach and in the intestines, tissue similar to that found in the outer covering of croton seeds was seen. The police sent the suspected poison and a grinding stone and by microscopic examination of the stone, as well as in the suspected poison, tissue resembling that found in the outer covering of croton seeds was seen. The quack was arrested and sentenced to undergo rigorous imprisonment for two years.

Bamboo shoots.—A woman, who was in criminal intimacy with a man, became pregnant. In order to cause abortion her paramour gave her the juice of crushed tender bamboo shoots to drink. She had vomiting and purging and died in about four hours. The post-mortem examination revealed discharge of froth from mouth and nose. The heart was full of dark liquid blood and the pericardium contained a quarter of an ounce of serous fluid. The lungs were soft and congested, the section being moist. The throat was congested. The peritoneum was congested. Liver, pancreas, spleen and kidneys were normal. The inner surface of the stomach and intestines was congested and there were spots of hæmorrhage in the mucous membrane of the stomach. The uterus was enlarged and contained a fœtus about six weeks old. The membranes of the brain and the outer surface of the brain were congested. Both from the viscera and from the crushed vegetable matter sent, a non-alkaloidal poisonous extract which gave chemical and physiological reactions similar to those given by the non-alkaloidal poisonous extract obtained from tender bomboo shoots was isolated.

Oduvan.—There were two cases of poisoning with oduvan leaves. In each of these two cases with the aid of the microscope, particles of leaf possessing all the characteristic microscopic appearances of oduvan leaf were found.

Oleandar as a love potion.—An old man and his wife were living with their married son and daughter-in-law in the same house. The wife of the old man prepared a chutney of tender tamarind leaves and left it in the house. The daughter-in-law acting on the advice of another woman mixed some substance in the chutney and left it where it was. The son tasted the chutney and rejected it because of its peculiar taste. The wife of the old man thought this was an insult to her skill as a cook and, to show how delicious the chutney was, started to eat the rice and chutney herself. After eating a little she had to give up because of the disagreeable taste. She had vomiting and purging but recovered. The remnants of the chutney were sent for analysis and from them the reactions of oleander were obtained. Further investigation by the police showed that the young woman mixed oleander with the chutney as a love potion to her husband. The case was compounded in court. To all appearances therefore, the potion had worked.

ANALYTICAL NOTES

Bamboo shoots.—The poisonous principle of tender bamboo shoots was extracted in the following manner:—

The acid alcoholic extract, after evaporation of the alcohol, was extracted with water and the aqueous filtrate was treated with lead acetate to remove the tannins. The excess of lead in the filtrate was removed by the addition of sodium phosphate and filtering. The filtrate on extraction with ether yielded a white crystalline residue freely soluble in water. This residue was found to be poisonous to frogs producing strychnine-like convulsions. It had no action when painted directly on the exposed heart of a pithed frog. It does not reduce Fehling's solution. The substance yields with concentrated sulphuric acid a rosy pink colour which on addition of a few specks of manganese dioxide gives a purple colour similar to that given by strychnine but of a lighter tint. Ferric chloride yields with the substance a faint purplish colour destroyed by acetic acid. In a case of suspected poisoning by bamboo shoots we were able to obtain the above reactions from the stomach and its contents.

Madar juice.—This poison has been a subject of study in this laboratory for several years. The botanical name of madar is *Calotropis gigantea*. In Tamil it is known as *erukkam* and in Telugu as *jilledu*. This plant grows wild almost anywhere in South India and is a shrub with thick fleshy leaves and pink or white flowers. On plucking the leaf or incising the stem or leaf, it exudes a thick white milky juice which may be collected in considerable quantities. The juice is used as an abortifacient by local application to the os uteri or is taken by the mouth as a poison.

The juice has a specific gravity of about 1.021 and the total solids amount to about 14.8 per cent (*vide* annual report for 1933). It is acid in reaction. It resembles blood in that after being left for some time

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it coagulates to a white coagulum leaving a clear straw-coloured serum. The serum contains about 3 per cent by weight of total solids and about 0.7 per cent of ash. The exact nature of the organic acid or acids in madar juice has not been determined, but the ethyl ester or esters are known to have a distinct characteristic odour. The ester or esters are obtained by making the juice alkaline with KOH, evaporating to dryness, extracting the residue with absolute alcohol and treating the alcoholic solution with dry HCl gas till distinctly acid. On leaving for some time and then diluting with water the characteristic odour of the ester or esters may be recognized.

An alkaline alcoholic extract of the coagulum on extraction with petroleum ether gives a white crystalline extract which can be identified by its colour reactions and also by the fact that it does not yield a digitonide.

The above alkaline alcoholic solution after extraction with petroleum ether, evaporation of the alcohol and treatment with water, or an alkaline aqueous extract of the coagulum after extraction with ether, on acidification with dilute sulphuric acid and further extraction with ether, gives in the ether solution a yellowish brown resin which is nearly insoluble in water but forms a deep yellow solution in aqueous alkali.

The white crystalline extract of madar juice is insoluble in water and was found to be non-poisonous when injected even in oily solutions into animals. The resin when treated with a caustic alkali and neutralized with acetic acid was found to be only slightly poisonous to frogs, about eight milligrams of the resin being necessary to kill a frog about 20 grammes in weight. The serum from madar juice (even after extraction with ether to remove any traces of resin) was found to be poisonous to frogs—.05 millilitre of the serum killing an adult frog in a few minutes. The serum when treated with lead acetate gave a precipitate. The filtrate when treated with hydrogen sulphide and filtered free from lead gave, after driving off the H_2S, evaporating to dryness, extracting the residue with absolute alcohol and evaporation of the alcohol, a poisonous extract half a milligram of which was fatal to frogs, producing convulsions followed by paralysis, death and bloating. Two hundred milligrams produced paralysis and death in a rabbit weighing about 34 ounces. The action on the frog and the symptoms and the post-mortem appearances in the rabbit suggest that it probably acts as a cerebro-spinal poison. The extract has no characteristic taste. The poisonous principle of madar juice would appear to be not a resin but a water-soluble principle. The exact nature of this principle is under investigation.

The following scheme of examination is at present in use in this laboratory in suspected cases of madar juice poisoning :—

The alcoholic extract of the viscus or other suspected material is divided into two portions (*a*) and (*b*).

Portion (*a*) is saponified with alcoholic potash and extracted with petroleum ether. The petroleum ether extract is evaporated to dryness, taken up with a little chloroform, treated with a slight excess of a solution of digitonin in rectified spirit, evaporated again to dryness and extracted with ordinary ether. This ether solution on evaporation gives a crystalline residue in the presence of madar juice. A little taken on a depression in a porcelain slab and treated with concentrated sulphuric acid gives a red colour. The addition of a few drops of chloroform and a few drops of acetic anhydride to this red colour changes it to a beautiful purple. The test may also be carried out on a watch glass placed over a porcelain slab.

The alkaline alcoholic solution after extraction with petroleum ether as above is evaporated nearly to dryness, taken up with absolute alcohol and filtered. The filtrate on treatment with dry HCl gas in excess and keeping for some time shows on dilution with warm water a characteristic pleasant ester odour in the presence of madar juice.

The other portion (*b*) is evaporated to dryness, taken up with water acidulated with acetic acid, filtered, treated with excess of lead acetate and again filtered. The filtrate is treated with excess of H_2S, filtered free from lead and evaporated to dryness over a water-bath. The residue is extracted with absolute alcohol and the alcoholic solution evaporated to dryness. A little of this extract on injection into a frog produces, in the presence of madar juice, convulsions ending in paralysis, death and bloating.

Correspondence

MEDICAL PRACTICE IN BENGAL

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—In the August 1937 number of the *Indian Medical Gazette* we have read an article written by Lieut.-Colonel Phipson, on the economic outlook of medical practice in India, in which he has described the very bad economic condition of the medical practitioners by facts and figures.

* * * *

The *bona fide* scientific medical treatment is costly no doubt and the majority of the villagers cannot afford to have it, and that is why qualified medical men come back unsuccessful from village careers in so large numbers and so frequently, and declare that medical practice in a village by a qualified medical man is impossible. For this reason, so many medical graduates and licentiates huddle together in towns and refuse to go to villages where innumerable people are dying at the hands of quacks in a pathetic manner, and this is no doubt a disgrace for a nation which claims to be civilized. Those who are in controlling positions in the Government are so apathetic that it seems as if they are quite unaware of the gravity of the situation. The attention of the persons in power should be drawn to this state of affairs and the following measures should be adopted with due earnestness without further loss of time.

(1) Abolition of quack practice by legislation, (2) state subsidy system in rural areas, (3) health insurance scheme in urban areas, and (4) appointment of licentiates as sanitary officers in health units.

In conclusion, it may be added that production from medical colleges and schools should be restrained, and adjusted according to the demand and supply rules, and production in excess of the needs of the country should be considered as a disastrous procedure in the long run.

Yours, etc.,
H. CH. BHATTACHARYYA, M.B.

SERAMPORE,
DISTRICT HOOGHLY,
17*th March,* 1938.

MAULED BY A LEOPARD

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I would like to report a case of leopard mauling because two comparatively new drugs were used in the case.

A man was admitted on 26th February, 1938, having been mauled by a leopard that afternoon. He had 3 parallel claw cuts across the scalp each about 4 inches long and down to the bone. He was operated on 5½ hours after the accident by the chief medical officer, Dr. H. Flack, to whom I am indebted for permission to publish this. The wounds were very carefully cleaned with Dettol and the edges cleanly excised right down to the bone, and sutured,

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Soluseptasine and Proseptasine (May and Baker) were given—5 c.cm. of Soluseptasine were given that night, and for the next two days 5 c.cm. were injected night and morning and 6 tablets daily of Proseptasine for 5 days. The temperature rose to 101°F., the highest, on the 28th morning and was completely down to normal on 3rd March. The wounds healed, the stitches were removed on the 4th, and one small sinus which remained was completely healed in two weeks.

Yours, etc.,
B. L. SEN, L.M.F.

SAMDANG TEA ESTATE,
DOOM DOOMA P. O.,
ASSAM,
14th March, 1938.

CASHEW FRUIT AND VITAMIN C

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—Let me bring to your kind notice the following fact about cashew fruit (not the nut):—

Cashew tree grows wildly on the west coast and the yield is very abundant from February till May in South Kanara. We know something about the nut and its kernel, but very little about the fruit.

Cashew fruit is very juicy and its taste is not bad. It is extremely cheap—a dozen fruits cost a quarter anna and sometimes less. It is highly recommended in South Kanara in smallpox (when the epidemic falls during the yield), and also for mothers to improve the quality of breast milk.

I happened to make rough experiments with the cashew (fruit) juice with regard to its vitamin-C content; the figure obtained was high and on comparing it with that of orange juice, I found cashew juice to be 6 to 8 times stronger in vitamin-C content. I corresponded with the Director of the Nutrition Research Laboratories, Dr. W. R. Aykroyd of Coonoor, to whom I sent two parcels of cashew fruits and he was very kind to send me his result in the following reply:—

'The vitamin-C content of the sample of cashew fruits sent by you has been determined, the figure obtained being about 376 mg. per 100 c.cm. of juice. This is a high figure as compared with that given by the majority of fruits.'

Knowing the above fact and also the common belief in South Kanara as regards the beneficial effect of the fruit in smallpox, I want to know whether there is any close dependence of smallpox on vitamin-C deficiency. No doubt an adequate supply of vitamin C plays an important part in the dietetic treatment of all fevers. But in smallpox, its epidemic constitution, the hæmorrhagic variety, its severity during pregnancy and in the old—all these may depend upon the deficiency of vitamin C—seasonal as well as individual, if the common belief can be relied upon.

Yours, etc.,
K. M. SHENAI, L.M. & S.

MANGALORE,
18th March, 1938.

THE DRUG CONTROL BILL

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—Towards the latter part of 1937 a bill was introduced in the Legislative Assembly of the Government of India to regulate the import into British India of certain drugs and medicines.

The bill has been referred to a select committee which is expected to meet towards the end of this month.

The necessity for legislation to ensure pure and potent drugs (whether imported or manufactured in India) in the market has been keenly felt. But the present bill is only a half-hearted measure inasmuch as the drugs manufactured in India are not included within its orbit.

The main cause of circulation in the market of adulterated or understrength drugs is the popular demand for cheapness and the tendency of unscrupulous manufacturers and dealers to exploit this is the reason why proper comprehensive legislation is a necessity and this fact was recognized by the Drugs Enquiry Committee presided over by Colonel Chopra in 1930-31.

If legislative control is introduced only to regulate imports of drugs and medicines the object will not be served. Such a course would only help to put the manufacturers of genuine drugs in India to a positive disadvantage. The stamp of genuineness, so to say, under which the imported drugs only will be sold will serve as a discrimination against genuine drugs manufactured in India and the drug industry in India itself will be put under a stamp of inferiority. Therefore, we suggest that with the control of imported drugs, simultaneously there should be introduced control of drugs manufactured in India.

Our past experience in the matter of excise policies of the different provincial governments teaches us that if such control is not exercised from the central government then there are bound to be different working rules in different provinces which will check free flow of trade in drugs. The Government of India felt this difficulty in the autonomous excise policies of the provincial governments, and recently had to call in a conference of excise commissioners to find out ways and means of making the provincial governments fall in one uniform line. Lest this error be repeated in the present matter of control of drugs we suggest that the control of drugs (whether imported or manufactured in India) should be by the central government.

Further, if the present bill and other future legislation on the same lines are to function, the government in framing the rules thereunder should be aided by expert opinion of non-officials, and it was in these circumstances that the Drugs Enquiry Committee also recommended formation of an advisory board.

Then there are various independent states in India from which manufactured drugs filter inside British India. The government should take steps that these states also pass similar legislation.

Finally as the testing laboratories for the purpose of the working of the Legislative measure will have necessarily to be under the control of the government it is desirable in order to ensure public confidence that government shall not be connected directly or indirectly with the manufacture of drugs.

To sum up, our suggestions are:—

1. The control of imported drugs and drugs manufactured in India should be simultaneous and be exercised by the central government.

2. There should be a provision for a statutory advisory board in the enactments.

3. Steps should be taken that independent states in India do also pass enactments exercising similar control within their area.

4. Government should not directly or indirectly be competitors with indigenous manufacture of drugs.

We have submitted a memorandum to the above effect to the Law Member, Government of India, and several public bodies have also expressed similar views.

Thanking you,

Yours, etc.,
J. N. LAHIRI,
Manager.

BENGAL CHEMICAL & PHARMACEUTICAL
WORKS, LIMITED,
164, MANIKTALA MAIN ROAD,
CALCUTTA,
24th March, 1938.

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Service Notes

APPOINTMENTS AND TRANSFERS

LIEUTENANT-COLONEL B. F. EMINSON, Civil Surgeon, Hyderabad, is appointed temporarily as the Director of Health and Prison Services, Sind, Karachi, *vice* Lieutenant-Colonel N. Briggs.

Lieutenant-Colonel W. J. Webster, M.C., is appointed to officiate as Director, Central Research Institute, Kasauli, *vice* Colonel J. Taylor granted leave, with effect from 1st April, 1938.

Lieutenant-Colonel G. C. Maitra, on return from leave, assumed charge of the duties of the Director, Pasteur Institute of Burma, Rangoon, on the forenoon of the 7th March, 1938.

Major J. Carrey joined the Indian Military Hospital, Rawalpindi, on reversion to Military duty from civil employment, Central Provinces, on 4th March, 1938.

Major R. W. H. Miller to be Officiating D. A. D. M. S., Southern Command. Dated the 5th March, 1938.

Major W. T. Taylor is appointed as Officer in charge, Medical Store Depôt, Bombay, with effect from the 7th March, 1938.

Major J. F. Shepherd, on return from leave, to act as District Medical Officer, North Arcot, and Superintendent, Government Headquarters Hospital, Vellore, with effect from the date of taking charge.

Captain G. F. Harris was transferred to civil employ as Medical Officer, Tochi Scouts, on 26th February, 1938.

Subject to the approval of the Secretary of State for India to the transfer of Captain M. H. Shah to the Civil Branch of the Indian Medical Service, that officer is appointed on probation as Additional Civil Surgeon, Delhi, with effect from the 1st March, 1938.

Captain B. A. Porritt on reserve duty in the Government General Hospital, Madras, to act as the District Medical Officer, Tanjore, Superintendent, Rajah Mirasdar District Headquarters Hospital, and Medical Officer, Borstal School, Tanjore, with effect from the date of taking charge.

LEAVE

Colonel J. Taylor, C.I.E., D.S.O., is granted combined leave for 4 months, with effect from the 1st April, 1938.

Lieutenant-Colonel R. Sweet, D.S.O., Officer in charge, Medical Store Depôt, Bombay, is granted 6 months' combined leave *ex*-India, with effect from the 5th February, 1938, the first two months being privilege leave and the rest on medical certificate.

In modification of previous order Lieutenant-Colonel P. Verdon, Acting Superintendent, Government Ophthalmic Hospital, and Professor of Ophthalmology, Medical College, Madras, is granted leave, *ex*-India, for 2 months and 15 days on average pay, and 6 months and 15 days on half-average pay, with effect from the 8th February, 1938.

Lieutenant-Colonel N. Briggs, Director of Health and Prison Services, Sind, is granted leave *ex*-India for 8 months, with effect from the 10th March, 1938.

Lieutenant-Colonel J. S. S. Martin, Officer Commanding, Combined Indian Military Hospital, Kohat, proceeded on 8 months' combined leave *ex*-India, with effect from the 11th March, 1938.

Lieutenant-Colonel M. D. Wadia, Civil Surgeon, Ambala, proceeded on leave on average pay for 3 months and 19 days, with effect from the 16th March, 1938, preparatory to retirement from the service.

Lieutenant-Colonel A. C. Macrae, Officer Commanding, Combined Indian Military Hospital, Dehra Dun, proceeded on 3 months' combined leave *ex*-India, with effect from the 25th March, 1938.

Lieutenant-Colonel E. W. O'G. Kirwan, Professor of Ophthalmic Surgery, Medical College, Calcutta, is granted leave for 3 months, with effect from the 18th March, 1938, or from any subsequent date on which he is relieved.

Lieutenant-Colonel H. S. Cormack is granted 8 months' leave on average pay from the afternoon of the 24th March, 1938.

Lieutenant-Colonel J. H. Smith is granted an extension of leave for 6 months to the 26th September, 1938.

Major C. F. J. Cropper is granted 10 months and 29 days' leave, including leave on average pay for 4 months and 5 days, leave on half-average pay for 24 days and study leave for 6 months. He is also permitted to combine with his leave the College vacations from the 22nd March, 1938, to the 15th June, 1938, and from the 1st October, 1938, to the 31st October, 1938, both days inclusive.

Major T. A. Malone, Staff Captain (Medical), Rawalpindi District, proceeded on 12 months' combined leave *ex*-India, with effect from the 14th March, 1938.

Major G. J. Joyce, who was on leave *ex*-India on average pay till the 20th March, 1938, has been granted, by the High Commissioner for India, an extension of his leave by 2 months up to the 20th May, 1938.

Major H. J. Rice, C.I.E., D. A. D. M. S., Southern Command, proceeded on 3 months' combined leave *ex*-India, with effect from the 5th March, 1938.

Major K. S. Fitch, Civil Surgeon, Hooghly, is granted leave on average pay for 8 months and in continuation leave on half-average pay for 2 months, with effect from the 10th November, 1937.

Previous notification is hereby cancelled.

Captain C. F. Garfit, who was doing general duty at the Mayo Hospital, Lahore, has been posted as Civil Surgeon, Jhelum, *vice* Captain B. Temple-Raston, transferred to Murree.

Captain R. C. Dracup, Officer in charge, Brigade Laboratory, Bannu, proceeded on 6 months' combined leave *ex*-India, with effect from the 11th March, 1938.

Captain D. W. Taylor, Ophthalmic Specialist, Lucknow, proceeded on 7 months and 7 days' combined leave *ex*-India, with effect from the 13th March, 1938.

PROMOTION

Promotion to present rank of Major B. D. Khurana is antedated to 28th April, 1937.

Captains to be Majors

J. S. McMillan. Dated 12th September, 1937.
M. R. Sinclair. Dated 1st February, 1938.
C. F. J. Cropper. Dated 8th February, 1938.

Lieutenants (on probation) to be Captains (on probation)

W. A. Hopkins. Dated 8th January, 1938, with seniority from 31st August, 1937.

J. L. Mewton. Dated 9th January, 1938, with seniority from 1st March, 1937.

J. W. R. Sarkies. Dated 9th January, 1938, with seniority from 31st August, 1937.

L. U. Kamm. Dated 9th January, 1938, with seniority from 31st August, 1937.

T. Denness. Dated 10th January, 1938, with seniority from 31st August, 1937.

The seniority of Lieutenant (on probation) A. E. B. de Courcy Wheeler in that rank is antedated to the 1st January, 1937.

RETIREMENTS

Lieutenant-Colonel T. D. Murison. Dated 7th November, 1937.

Lieutenant-Colonel Som Dutt. Dated 28th March, 1938.

RELINQUISHMENT

Captain S. S. Alam (Temporary Commission). Dated 9th November, 1937.

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Notes

'WELLCOME' BRAND CALCIUM MANDELATE COMPOUND

THE introduction of 'Wellcome' brand calcium mandelate compound by Burroughs Wellcome and Company represents an important advance in mandelic acid therapy for urinary infections. Calcium mandelate has been found to be as effective therapeutically as sodium or ammonium mandelate and, since it is free from many of the disadvantages associated with these salts, may be regarded as the preparation of choice. In the stomach calcium mandelate is broken down into calcium chloride, most of which is converted into non-absorbable calcium salts in the intestine, and mandelic acid which is excreted unchanged in the urine in sufficient concentration to produce a bacteriostatic effect. In the degree of urine acidity produced it is equal to ammonium mandelate and superior to sodium mandelate.

'Wellcome' brand calcium mandelate compound is a suitably flavoured powder of which 4.4 grammes (the normal adult dose) is equivalent to 3 grammes of mandelic acid. It is entirely free from the disagreeable taste characteristic of sodium and ammonium mandelates and readily mixes with water to form a suspension. The product is issued in bottles of 125 grammes, together with a measure corresponding to an adequate dose, and a supply of test papers to enable the urine acidity to be checked daily during administration.

FUMIGATION WITH CALCID

FUMIGATION of rats with calcium cyanide is practised on a fairly wide scale in India. It is a method of treatment that is rapidly superseding other measures such as trapping and poison baiting as it is easily applied and the gas evolved from the calcium cyanide is one of the most deadly known. The method is simple in that it is only required to blow a very small quantity of the material into a rat burrow, close the burrow up and leave it—no rat or flea will remain alive in it. Considering the labour involved and the range of efficiency of the gas it would be difficult to find a more economical method.

The lethal property of hydrogen cyanide is well known to most people and because of the danger to human life it has not, until very recently, been used as a fumigant to the extent that it might have been. It is however available in various forms which greatly simplify its application, and with ordinary care, these can be handled with hardly any danger at all to human beings.

It is not sufficient, however, to be well manned and well equipped, but the greatest factor governing successful results lies in the organization of a campaign. Rats by nature are venturesome creatures and forage far afield, and unless realization of this fact is constantly borne in mind any scheme for exterminating them, no matter what the medium employed, can hardly be expected to prove entirely successful. Haphazard methods of attack are uneconomical, and, from a plague preventive point of view, in an endemic area, useless.

A booklet has been issued by the Havero Trading Company which is devoted almost entirely to the practical application of Calcid (a high grade calcium cyanide) as a rat and flea control measure, and, in order that it can serve as a useful guide to health officers, an endeavour has been made to make the practical side as complete as possible and to cover the varied conditions encountered in field work.

Primarily it is intended to bring to the notice of health officers concerned in plague prevention work the value of an exterminating medium which, if used systematically, will bring them nearer to the solution of their big problem—entire eradication of plague-susceptible rodents.

The properties of Calcid are described and sound practical advice given for handling it to the best advantage, so that the intending user need have no fear that he will have to experiment with an untried article, or, as a novice, commit some detrimental action through nervous uncertainty.

We have mentioned that the use of hydrogen cyanide in public health work has been handicapped owing to its dangerous properties, but the reader should know that the calcium cyanides (which give off hydrogen cyanide) are used very extensively as citrus tree fumigants in nearly every country in which citrus is grown. Literally hundreds of tons are used annually for this purpose and although no gas-masks are worn by the fumigators, and in spite of the fact that relatively large quantities of the gas are released, death as a result of accidental poisoning is unknown.

When employing calcium cyanide for rat and flea destruction purposes the quantities of gas used are generally very much less than those used for tree fumigation, but certain precautionary measures must be taken because other factors are not the same. In one instance there is an open orchard—in the other a populated area, and though the possibility of any one succumbing to gas-poisoning during ordinary 'preventive' measures is remote, the health authority cannot afford to take the slightest risk.

The booklet has been written in the simplest language, without any attempt at literary style or grammatical perfection. Subordinates who are responsible for applying the material will be able to follow the text without difficulty and so take some part of the responsibility from the shoulders of the senior medical or plague officer.

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Original Articles

TREATMENT OF SCHIZOPHRENIA BY INDUCING EPILEPTIFORM SHOCKS BY THE DRUG CARDIAZOL

AN EXPERIMENTAL STUDY OF 42 CASES

By J. E. DHUNJIBHOY

LIEUTENANT-COLONEL, I.M.S.

Medical Superintendent, Ranchi Indian Mental Hospital (Bihar)

SCHIZOPHRENIA is the psychiatrist's biggest and most urgent problem, and constitutes a challenge to investigators in every field of medical research. Its ætiology is unsettled, its pathology unknown and its clinical limits in dispute, and yet it is a more serious problem than either tuberculosis or carcinoma. In the United States of America statistics show that each year some thirty to forty thousand individuals soon after adolescence or in the first flush of manhood or womanhood fall victims to this dread disease. Annually at least more than one-quarter of the patients admitted to mental hospitals in Europe and America are suffering from this disorder and the number of cases admitted to mental hospitals in India would appear to be similar. It takes its toll of the young at an age when the promise of life is normally at its brightest and strikes at the poor and rich alike. It cuts off its victims from the normal human activity and intercourse, and condemns them to a life hemmed in by high walls and prohibitions which no matter how camouflaged by kindness or softened by sympathy make mere existence a living death or what the present-day psychiatrists prefer to call 'a vegetative existence'. The importance of schizophrenia from the mental hygiene (public health) viewpoint needs no further emphasis and preventive measures are of the utmost importance. In the early stages the prognosis is not always poor and the condition does not always end in dementia. Spontaneous remissions are also possible, especially in the early stages of the illness but many of these remissions are temporary and of comparatively short duration. The percentage and duration of spontaneous remissions are extremely arbitrary. Some authorities put down the figure for spontaneous remissions to be between 10 to 15 per cent. The numerous theories often advanced to explain schizophrenia are hopeful confessions of our ignorance; it is only natural that its treatment should be empirical. As the line of treatment is empirical, a large variety of organic and inorganic substances have been tried by psychiatrists from time to time and they are still applying these methods in order to ameliorate the condition of the patients rather than stand by and watch them deteriorate, and their efforts are sometimes rewarded by success. Among the various methods of empirical treatment of schizophrenia the following hold pride of place :—

(1) Pyrexial treatment. The production of fever in patients by injections of typhoid vaccine, sterile milk, pyrifer sulfosin, Dmelcos vaccine, by inoculation of malaria, by diathermy or by any other means.

(2) Glandular products of various kinds, especially testicular, thyroid and ovarian extracts.

(3) Prolonged narcosis by various sedative drugs such as somnifaine, soneryl, sodium amytol, nembutol, luminal, somnos, hypnol, and sodium evipan.

Prolonged narcosis by somnifaine is still in vogue in England and on the Continent.

Advocates of one or more of the above-stated empirical methods of treatment of schizophrenia will not be found wanting, and no doubt these methods have achieved sporadic success and have caused a certain amelioration of symptoms, yet the results have not been such as to commend them universally for the routine treatment of schizophrenia. Moreover all the above methods of empirical treatment of schizophrenia were tried by me from time to time on the schizophrenics of the Ranchi Indian Mental Hospital, which is the largest and one of the most modern mental hospitals in India. The results of our successes and failures with these methods of treatment were fully stated in our annual reports of the hospital, and some with encouraging results were published in medical journals. Recently to the vast armamentarium of the schizophrenic empirical treatment are added the insulin hypoglycæmic therapy by Dr. Manfred Sakel of Vienna and the epileptiform shock therapy by the drug cardiazol by Dr. Ladislaus V. Meduna of Budapest. It is the writer's aim in this paper to describe in full his own experience of 'convulsive therapy' of schizophrenia as evolved by Dr. Meduna.

Since the introduction of 'insulin therapy' in schizophrenia by Dr. Manfred Sakel typical epileptiform attacks are frequently observed in patients undergoing this treatment. Both in Vienna and Munsingen (Switzerland) cases have been observed with such attacks during insulin treatment and it was reported that when an epileptiform attack appeared it produced a very favourable effect. Recently a case of status epilepticus during insulin treatment was recorded by Gillies (1937). Incidentally Dr. Hunter Gillies in this article has also mentioned the work of Dr. Ladislaus V. Meduna. When I was in Budapest in 1935 I was invited by my friend and colleague Dr. Meduna to see his treatment of schizophrenia at the Royal Hungarian State Mental Hospital, Budapest. I was so impressed with all that I saw and more so with the good results obtained by Dr. Meduna by this treatment that I decided to try the treatment in my hospital on my return to India. I will describe in short the

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theory and technique of Dr. Meduna's treatment by cardiazol before I narrate my own experience with this treatment.

The theory.—Dr. Meduna for a long time held a theory that there might be some biological antagonist to schizophrenia just as Hofrat Professor Wagner-Jauregg found biological antagonism between malaria and neuro-syphilis. Dr. Meduna with this end in view made an exhaustive study of the literature on epilepsy and schizophrenia and accidently he came across an article written by one of the Continental authorities on epilepsy wherein the author had stated that epilepsy and schizophrenia are very seldom found in combination in one and the same person. Dr. Meduna was very much impressed with this new knowledge and he made further studies on this line and was later convinced that there was some biological antagonism between schizophrenia and epilepsy. For years he carried out experiments, firstly on animals and later on patients, with various drugs to induce epileptiform fits and found that 25 per cent camphorated oil solution given intramuscularly produced the best results. He obtained 10 remissions out of the first 26 cases of schizophrenia treated by camphor injections, but later he found that the tolerance to camphor with patients differed greatly and he was compelled to seek a more stable and reliable medicament for this purpose. Finally, he tried Knoll's cardiazol and the results obtained were highly satisfactory. Cardiazol (penta-methylene-tetrazol) is generally known to the profession as a water-soluble synthetic preparation having pharmacological effects similar to camphor, to which it is distantly related to camphor chemically. The dose given for inducing epileptiform fits is far in excess of the one usually prescribed in clinical practice of this useful drug, yet it has no injurious effect on the normal heart and is not cumulative in its action. I have no intention in this article of entering into any discussion about the theory on which this treatment was evolved by Dr. Meduna, however fantastic it may appear. I am only dealing with the practical side of it, *viz*, the results obtained by this treatment. Dr. Meduna claims to have obtained 40 to 50 per cent remissions in schizophrenics by this treatment.

Technique and dosage as evolved by Dr. Meduna.—Dr. Meduna starts the treatment by using a 10 per cent solution of cardiazol, commencing with an injection of 5 c.cm. and increasing each injection by one c.cm. until the fit is produced. Should 5 c.cm. induce a fit the dose for that particular patient is not increased. One may use a solution of greater strength but in any case Dr. Meduna suggests commencing with 0.5 gramme of cardiazol and if necessary increasing each successive dose by 0.1 gm. The intravenous route is always preferred but if this is not possible on account of the depth of the veins the injections may be given intramuscularly the dose then being increased from 0.3 gm. to 0.5 gm. above the intravenous dose. No definite plan can be laid down as to how many injections are necessary for each case as they vary considerably in different patients. Some schizophrenics have shown full remissions with 3 or 4 injections and others have not improved at all after 20 to 30 injections. However, Dr. Meduna suggests that no case should be given up as hopeless for this treatment without giving the patient the benefit of at least 20 such injections, or, to be more accurate, 20 such convulsive shocks. Dr. Meduna has tried this treatment on a large number of cases and has obtained 40 to 50 per cent remissions without any untoward results.

Contra-indications for treatment.—The treatment is contra-indicated in acute bodily illness or chronic disease affecting the heart, blood vessels, lungs and kidneys.

Our experience with cardiazol therapy

For the purpose of this experiment I selected 42 typical cases of schizophrenia. Cardiazol was not obtainable in India in powder form so I wrote to Messrs. A. G. Knoll for a free supply of this powder and the firm readily responded to my request and sent me a sufficient quantity for the experiment. The majority of cases selected were chronic schizophrenics who had not responded to any of the known treatments for this disease.

Preparation of patients for cardiazol treatment

A routine examination of heart, urine and blood pressure of each patient was made a day previous to the one fixed for injection. All patients are given a cup of hot milk at about 7 a.m. and are then taken to a special ward opened for the purpose, where the beds are screened from each other. The injections are given as a rule at 9 a.m. An attendant is posted with a tampon in his hand behind the head of the patient's bed. One attendant is placed on either side of the patient's bed to prevent him from falling out or being injured during the fit. The fourth attendant prepares the patient's arm and holds it to be ready for the intravenous injection by the doctor. A second doctor stands at the foot of the bed with a watch to time the injection and the fit and to make clinical observations. In order to allow unhampered movements of the extremities during the fit no clothes are allowed except short pyjamas which are also undone at the waist. The cardiazol is then injected, due attention being paid to the speed at which the solution enters the vein.

A typical fit.—Immediately after the injection and sometimes before the needle is withdrawn the patient's eyelids begin to quiver—a sign found in the majority of patients—the face becomes anæmic, the body stiffens and the patient makes a few futile attempts to get away from the bed by irregular movements of the hands and feet. He then loses consciousness

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and a typical tonic stage sets in. The posture is with clenched hands, wrists and elbows slightly flexed, arms held to the sides, the legs extended, also the back, and the face becomes cyanosed. The patient at this stage never fails to open his mouth and he keeps it conveniently open for a few seconds and this is the time the attendant inserts an improvised tampon to prevent the patient from biting his tongue. The tampon is made 6 inches long and ¾ inch thick. In the few seconds that follow the clonic stage starts and the convulsions take the form of irregular jerks and spasms. During this phase some patients pass urine and some ejaculate with or without erection. At the end of the clonic stage the patient goes into a deep coma-like sleep which lasts from 5 to 20 minutes. The patient then regains consciousness; he first appears to be confused and dazed and it is better to let him sleep and not to disturb him with questions. I always encourage the patients to sleep for a few hours and no one is allowed to leave the bed for at least 5 to 6 hours after the fit. As far as possible no food or drink should be allowed for a few hours after the injections as they are often rejected by the stomach if given earlier. Our routine is to give injections at 9 a.m. and to serve food at about 2 p.m. Formerly the injections were given twice a week but now they are given every alternate day.

Collective and individual peculiarities in our cases

(1) The tonic and clonic stages differed in individual cases. Some had a good tonic stage and others clonic. We found that those patients who had good and prolonged clonic stages eventually derived much benefit by the treatment.

(2) Fifteen patients invariably showed post-epileptic excitement which lasted for a few hours after each injection, but in the night they slept well without any hypnotics.

(3) Four patients after the fit always used to scratch their necks, thighs, groins and arms for a few minutes only.

(4) Two patients always used to spit after coming out of the fit and this mannerism continued for a few minutes.

(5) Five patients always gave an 'epileptic cry' before the onset of the tonic stage.

(6) Two patients always smacked their lips for a few minutes after coming out of the fit, as if they had some taste left in the mouth by the drug and their gestures proved that it was by no means pleasant.

(7) Ten patients always remained in an hilarious condition after the fit for about half an hour. They sang songs and showed feelings of well-being almost like the first stage of alcohol intoxication.

(8) One katatonic patient who had murdered his brother and never admitted it before the court or to anybody else suddenly one day after the fit made a frank confession of his crime and described in detail the scene of murder which when verified with the police report was found to be correct. On the other hand we tried to get a confession out of another patient who was also charged with murder and would not admit it, but we failed in this case.

(9) A katatonic with marked flexibilitas cera and mutism on the day of the fifth injection implored us not to give him the treatment and said that he would act and behave like a normal person in every way. I gave him a chance and he behaved very like a normal person for two days but relapsed on the third and the treatment was continued in his case and after a full course he showed a great improvement in his katatonic condition.

(10) Three patients during the course of injections twice showed conditions like larval epilepsy or epileptic equivalents, *i.e.*, their fits after a full dose of cardiazol (1 gm. in 10 per cent solution) were replaced by a condition of excitement almost amounting to furor which lasted for 15 to 30 minutes. On coming round the patients had no memory of their excitement and they showed complete amnesia of events, a point of great medico-legal importance.

(11) Some patients as soon as the drug was injected started coughing a little as if the drug had irritated their throats and they invariably went into fits. The cough is now regarded by us as an unfailing sign for the production of fits.

Dangers and complications.—I am glad to be able to state here that not a single case showed any dangerous symptom and I agree with the findings of Dr. Meduna that the treatment is perfectly free from any danger in selected cases. Four patients during fits had dislocations of shoulders which were soon put right when they were in the amnesic state and with proper care the trouble never recurred, although we subsequently induced many fits in the same patients.

It is said that any hypnotic, especially morphia, hyoscine, paraldehyde and sodium evipan, will counteract any dangerous symptoms produced by cardiazol. In our emergency tray these drugs were always kept ready for immediate use but we never had any occasion to use them.

Comments

We found in our series of cases that those patients in whom severe fits were induced by the initial dose of 0.5 gm. of cardiazol for the first 8 to 10 injections showed better improvement than those in whose case the initial dose had to be increased in the first 4 or 5 injections to 1 gm.

(2) Rapidity of injections also plays a great part in the induction of fits. We experimented

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with large doses of stronger solution and injected the dose very slowly and no fits were produced but in the same patients the next day we gave 0.5 gm. dose at a speed of 1 c.cm. per quarter second and produced beautiful fits. Our usual rate of injection is 5 seconds.

(3) The treatment is very simple and can be undertaken by any physician with a little knowledge of the technique.

(4) It is true that the induction of epileptiform fits in patients is not a very pleasant sight for onlookers but to the patients themselves it makes no difference as they become unconscious at the very onset of the fit and even on recovery they do not remember anything. In fact, they have complete amnesia of events. Patients generally learn about the fits from other patients or the attendant staff, or at times after recovery from a fit they sometimes try to peep through the screen when other patients are being given the same treatment in their ward, although every effort is made to prevent the patients from getting the information.

This point was further elucidated by giving injections to one of the staff who volunteered to undergo this treatment in the cause of science. He also informed us that he had no knowledge of what happened from the time the needle was introduced into his vein until he recovered his senses. He further said that he suffered no pain or felt no shocks and did not remember anything (complete amnesia of events).

(5) On the days when no cardiazol is given, patients are allowed to attend the occupational therapy classes and to take part in all daily activities of the hospital life.

Results of our experiment and conclusions

Out of 42 cases selected for the experiment there were 31 males and 11 females. The following table shows the number and types of schizophrenics selected and their sex :—

TABLE I

Number of cases	Types of schizophrenics	Male	Female	Total
15	Katatonic ..	11	4	15
17	Hebephrenic ..	13	4	17
8	Dementia paranoides.	6	2	8
2	Simple dementia	1	1	2

Table II shows the results of our experiment on 42 cases :—

TABLE II

Number of cases	Types of schizophrenics	Full remissions	Improved	Stationary
15	Katatonic ..	7	4	4
17	Hebephrenic ..	5	9	3
8	Dementia paranoides.	1	2	5
2	Simple dementia	..	..	2

Table III gives more information of the 13 cases who got full remissions and were subsequently discharged as quite recovered by the board of visitors of the hospital :—

TABLE III

Serial number	Types of schizophrenics	Sex	Period of stay in the hospital before the commencement of the treatment			Number of injections given and amount				Remarks
			Y.	M.	D.	Total	0.5 g.	0.6 g. to 0.8 g.	1.0 g.	
1	Katatonic ..	M.	3	5	..	20	7	..	13	Discharged as fully recovered.
2	Hebephrenic ..	M.	..	11	10	11	11	..	..	He has now rejoined his office as a clerk.
3	Dementia paranoides	M.	1	..	..	13	8	..	5	Discharged as fully recovered.
4	Katatonic ..	M.	1	1	..	20	7	2	11	Do.
5	Do. ..	M.	..	6	6	11	8	3	..	Do.
6	Do. ..	M.	..	3	8	10	4	4	2	He has now rejoined his service on the railway.
7	Do. ..	M.	..	3	3	7	1	..	6	He is now working as a salesman.
8	Hebephrenic ..	M.	1	6	..	6	4	2	..	Discharged as fully recovered.
9	Katatonic ..	M.	..	3	15	5	5	..	..	Do.
10	Hebephrenic ..	M.	..	2	18	11	8	3	..	Do.
11	Katatonic ..	M.	..	5	8	30	27	3	..	Do.
12	Hebephrenic ..	F.	..	3	19	12	12	..	..	Do.
13	Do. ..	F.	..	11	0	11	3	8	..	Do.

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Table III shows that schizophrenics are curable in their early stages and the earlier the treatment is applied the better are the results. The majority of the cases who improved under treatment were early cases as shown in column 4 of table III. All the discharged patients have still maintained the improvement. Case 11 was brought on a stretcher as an acute case of katatonia. On admission he could neither walk nor talk, he refused to take his food and was fed nasally for a few days. After the third injection of cardiazol he began to talk and took his food and after the tenth injection he became quite normal and began to walk. He was given a full course of 30 injections—27 or 0.5 gm. and 3 or 1 gm. He improved very much in his mental and physical health and was discharged as fully recovered by the board of visitors. In my opinion this was a great success for cardiazol as the case on admission appeared to be quite hopeless. Of the 15 improved cases 5 have since relapsed after maintaining the improvement for a varying period from 2 to 5 months. The remaining 10 cases have still maintained the improvement and are now working satisfactorily in the hospital. By improvement, I mean those cases who before the treatment were noisy, attitudinistic, negativistic, showing flexibilitas cera and a few of them were partly living a vegetative existence, improved after cardiazol injections inasmuch as they began to take an interest in their surroundings and in themselves and are now attending the occupational therapy departments in the hospital, to which place they refused to go and work before. Fourteen cases showed no improvement at all in spite of the full course of 20 to 30 injections given to them and they remained stationary. The results of the experiment can be called encouraging and the results in percentages were as follows :—

Full remissions	..	31 per cent
Improved	..	36 „ „
Stationary	..	33 „ „

All the recovered cases were given four extra injections after recovery as recommended by Dr. Meduna. In all our cases we were able to induce the first fit at an initial dose of 0.5 gm. of cardiazol and in most cases this initial dose failed later and we had to increase the dose in graduations up to 1 gm. One gramme of cardiazol never failed to induce fits in all our patients hence our initial dose for every patient was 0.5 gm. and maximum dose 1 gm.

The diagnostic aid of cardiazol in suspected cases of epilepsy

Dr. Schönmehl (1936) gives an interesting account of cardiazol as an aid to diagnosis in suspected cases of epilepsy and other allied conditions. During his experiments on stuporous conditions in epilepsy he found that fits could be induced in epileptics by very small doses of cardiazol (0.5 to 3 c.cm.). We also experimented with our epileptic patients with small doses of cardiazol which failed to induce fits in our schizophrenic patients but induced severe fits in epileptic patients. Doses given by us were from 1.5 c.cm. to 3 c.cm. Dr. Meduna states that to produce epileptic fits in a normal healthy individual the dose required would be approximately 10 c.cm. only. In schizophrenic cases we could not induce fits below the minimum dose of 0.5 gm. It therefore proves that the small doses of cardiazol can produce convulsive fits in epileptics only. One of the patients of Dr. Schönmehl had been successful in convincing the authorities when applying for a motor driving licence that he was not a sufferer from epilepsy. He was brought to Dr. Schönmehl who injected a small dose of cardiazol and induced severe fits in him and thus confirmed the diagnosis. We had a patient in the female section who was a suspected case of epilepsy; no medical officer had seen her in a fit because she had occasional fits only during the night and by the time a medical officer was called the patient had recovered from the fit, as she was suffering from a mild type of epilepsy. We therefore decided to use cardiazol in this case and injected 2.5 c.cm. of cardiazol; the patient went into a fit at once. We could not carry out further experiment by cardiazol in this direction as we had no other suspected cases of epilepsy.

Summary

(1) The problem of schizophrenia is very briefly described with its empirical treatment.

(2) Forty-two cases of schizophrenia were treated with cardiazol after the method of Dr. Meduna; the technique fully described.

(3) The results of the experiment were encouraging.

(4) Cardiazol treatment appears to be perfectly safe in selected cases and is well worth a trial in all cases of schizophrenia, and more so in the katatonic and hebephrenic varieties.

(5) It is free from any dangerous complications and does not require such constant medical and nursing attention as in the case of insulin therapy. I would certainly give this treatment preference over insulin therapy.

Acknowledgments.—We are indebted to Messrs. A. G. Knoll for the free supply of cardiazol powder for our experiment.

I should like to acknowledge my appreciation of the valuable help I have received from the medical and nursing staff of the hospital.

I am also indebted to my friend and colleague, Dr. Gyarfas Kalman of Budapest, for the translation of Dr. Meduna's paper.

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THE TREATMENT OF ASCARIASIS

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THE comparison of the results of treatment with santonin of Russian and Indian origin, given alone or combined with oil of chenopodium, was reported by Maplestone and Mukerji (1931). It seemed that the combination of the two drugs was slightly better than either alone, so it has been further investigated. In our original work the full dose of santonin given was five grains and of oil of chenopodium fifteen minims. The oil of chenopodium was placed in hard gelatin capsules and the santonin given as a powder, the two drugs being swallowed together with the assistance of a little water, and they were followed in two hours with a dose of magnesium sulphate. This dosage was continued for a time and then it was resolved to reduce the amount of santonin to four grains leaving the amount of oil of chenopodium unchanged. Other series of treatments were successively tried, reducing the santonin first to three grains and then to two grains as the maximum dose, but always given with fifteen minims of oil of chenopodium.

In the table the reduced doses of oil of chenopodium given to children are shown and it should be noted that the dose of santonin was also proportionately reduced from the maximum in each series. For example, seven or eight minims of oil of chenopodium would be accompanied by two and a half grains of santonin when the maximum dose was five grains, but when the maximum dose of santonin was only two grains the amount given with a half dose of oil of chenopodium would be only one grain. The reduction in santonin was, as nearly as possible, kept proportionate to the reduced dose of oil of chenopodium in this way but the minimum amount of santonin given was half a grain in any series.

The figures shown under the maximum dose of five grains of santonin and fifteen minims of oil of chenopodium include those given in the paper quoted above with the addition of a few more treatments. In these early treatments the oil of chenopodium was known to contain at least 60 per cent of ascaridole, and after its standardization, which occurred about the time our series with four grains of santonin as a maximum was commenced, all the oil used has been of *British Pharmacopœia* standard.

The table needs little comment as the results are fairly evident. The main point that emerges is that the reduction in the amount of santonin appears to have little effect on the result of treatment when it is combined with oil of chenopodium, but the reduction in the amount of oil of chenopodium has this effect and is indicated in all the series by the reduced cure rate in children compared with adults. When only the full doses of both drugs are considered it will be seen that the cure rate in 33 out-patients who had two grains of santonin is 81.8 per cent whereas all the other full doses of santonin combined with fifteen minims of oil of chenopodium give a cure rate of at least 94 per cent and the mean cure rate for all full dose treatments is 91.9 per cent. Statistically the low cure rate of 81.8 per cent with two grains of santonin in the 33 out-patients is not found to be 'significant' compared with the higher rates obtained with other doses. When the reduced doses of oil of chenopodium are considered it is found that the low cure rate from the 9-8 minim group onwards is definitely 'significant' but that the rate of 83.3 per cent in the 12-10 minim group is not 'significantly' lower than for the 15 minim group, but this does not invalidate the general conclusion that the fall in cure rate varies directly with the reduction in the dose of oil of chenopodium.

In a vertical column at the end of the table the cure rate for the various groups of cases classified according to the full dose of santonin is shown and it will be seen that the variation is very slight and quite irregular thus further confirming the contention that the dose of oil of chenopodium has a much greater bearing on the cure rate than that of santonin, when the two drugs are given together.

In the case of most drugs the therapeutic effect varies directly with the size of the dose and the size (or weight) of the patient so that corresponding effects are obtained in adults and children by reducing the dose proportionately on this basis. This principle does not appear to operate in the case of oil of chenopodium, but it is really the worms living free in the intestines and not the patient that are being treated. The worms are just as large in children as they are in adults so this may partly explain the comparative inefficiency of small doses of oil of chenopodium in children. It cannot be the full explanation, however, because the smaller volume of the child's intestine should give a concentration of the drug in a reduced dose approximately equal to that given by a full dose in the intestine of an adult. Another explanation of this discrepancy, that we offered in our former paper, is that the majority of intestinal helminths more readily infect young animals than adults, and from this it may be deduced that the power of these worms of maintaining themselves is greater in the more susceptible child than it is in the more resistant adult,

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TABLE

Santonin, grains		Oil of chenopodium, minims																Cure rate, santonin		
		15		12		10		9		8		7		6		5		4		3		2				
		Cured	Treated	Cured	Treated	Cured	Treated	Cured	Treated	Cured	Treated	Cured	Treated	Cured	Treated	Cured	Treated	Cured	Treated	Cured	Treated	Cured	Treated	Totals cured	Totals treated	Percentage cured
5	In-patients ..	18	19	13	15	0	0	3	6	2	2	0	0	4	5	0	0	0	0	1	1	0	0	41	48	74.1
	Out-patients ..	0	0	4	4	0	0	3	3	1	1	0	0	5	7	0	0	6	6	12	8	4	0	22	37	
4	In-patients ..	6	6	2	2	2	2	0	0	4	4	0	0	1	1	0	0	4	4	1	1	0	0	16	20	68.1
	Out-patients ..	4	4	1	1	1	2	0	0	3	2	0	0	1	1	1	0	8	3	1	1	3	1	14	24	
3	In-patients ..	21	22	0	0	2	2	0	0	5	4	3	3	1	1	5	4	1	1	0	0	0	0	36	39	76.0
	Out-patients ..	5	5	0	0	1	1	0	0	2	2	2	1	2	2	11	6	0	0	7	2	6	2	21	36	
2	In-patients ..	21	22	0	0	0	0	0	0	4	3	4	4	1	1	2	0	3	2	0	0	1	0	31	37	73.7
	Out-patients ..	27	33	1	1	0	0	0	0	12	9	15	7	4	3	3	3	21	11	4	3	0	0	64	93	
	TOTALS ..	102	111	23	19	7	6	9	6	33	25	24	15	22	18	22	13	43	22	26	16	14	3	..	..	..
	Per cent cured ..	91.9		82.6		85.7		66.6		75.8		62.5		81.8		59.1		51.1		61.5		21.3		..	..	..
Cure rate for oil of chenopodium.	Smoothed percentage	91.9		83.3				73.8				71.7				53.8				47.5				..	..	

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A CLINICAL INVESTIGATION ON THE VALUE OF PROSEPTASINE AS A PROPHYLACTIC IN PUERPERAL INFECTION

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THE last three years have seen spectacular changes in, and a revival of, the chemotherapeutic treatment of streptococcal infections.

Domagk in 1935 showed that a red dye, the hydrochloride of 4′sulphamido-2:diamino-azobenzol, when administered orally prevented death in mice that had been inoculated intraperitoneally with hæmolytic streptococci. This dye was marketed under the name of Prontosil and was immediately used and reported on by Colebrook and his co-workers (1936) in the treatment of streptococcal infections of labour and the puerperium.

Colebrook (1937) indicates the probability that the simpler derivatives (now classed as sulphanilamides) would prove to be the active principle of the azo dyes. He also expressed the hope that the sulphanilamides would exert a prophylactic effect on hæmolytic streptococci and has shown experimentally that para-aminobenzene sulphonamide confers considerable bactericidal power upon human blood when added to it *in vitro*, and that in order to protect animals it was necessary for an effective dose of the drug to have been given within a few hours (not more than six) before the animals were infected.

The carefully-recorded cases and conclusions of Colebrook and his co-workers indicate that the diazo compounds act at their optimum efficiency if administered before tissue invasion has occurred. Our own clinical experience coincides with these conclusions. Where tissue invasion has occurred we are not, as yet, impressed with the results obtained by treatment with the diazo compounds.

Hospital midwifery practice in India is peculiar in that it deals with a large number of potentially or frankly infected cases. Most of the emergency cases admitted to hospital have received attention from trained or untrained *dais*, varying from a few vaginal examinations to manipulative interference resulting in a patient almost completely moribund. In our own clinic during 1937 no less than 479 out of 663 were classed as emergency. The morbidity for the years prior to 1935 varied from 22 per cent to 25 per cent and this includes only those cases in which the infection was of genital origin.

Although a curative drug is of undoubted value, we consider that under existing conditions a prophylactic one is of even greater value, and that, if a drug when administered prophylactically causes a marked reduction in the morbidity rate, it is worthy of consideration and careful investigation. We have during 1937 administered proseptasine prophylactically to all emergency cases admitted to hospital. For this purpose Messrs. May and Baker kindly supplied us with adequate supplies of the drug.

Proseptasine is *p*-benzyl-amino-benzene-sulphonamide, a white tasteless substance made up in tablets of 0.5 grm. for oral administration.

Dosage.—From January to June 1937 we gave two tablets three times daily (3 grm.) for four days.

From July to December 1937 we gave four tablets three times daily (6 grm.) for four days.

The drug was administered to all emergency cases and as early as possible.

Experimental conditions

During the period under test (1937) the conditions have been as constant as is possible in a teaching institution. 1930 to 1935 has been spent in standardizing administration and technique and we consider that since 1935 we have been able to work under conditions that were constant and under control.

1. The hospital technique is controlled by the medical superintendent.
2. The medical staff and the major part of the responsible nursing staff is permanent.
3. Statistics for 3 years have been kept by a group of trained medical officers.
4. No additional treatment has been given during the period in which proseptasine has been administered.
5. The diagnosis of the cause of morbidity has been arrived at after a routine examination.

Causative organisms in general infection

It has not been possible to investigate the bacteriology of the genital tract in the cases admitted during 1937. Nor have we any information regarding the organisms causing genital infection in India. Such information is badly needed and is forming the subject of an inquiry now commencing at this hospital.

Taylor and Wright (1930), examining the bacteriology of the vagina in 1,123 women prior to delivery, found the following :—

	Per cent
Non-hæmolytic streptococci ..	37.8
Hæmolytic streptococci ..	2.7
Pseudo-hæmolytic streptococci ..	1.3
Staphylococci	58.8

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hence they are not so easily dislodged from the former as they are from the latter by the same treatment.

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Margaret Thomas (1930) investigating a group of 800 cases found the following organisms :—

	Per cent
Streptococci ..	.. 39.3
Streptococci and others	.. 13.7
Staphylococci ..	.. 16.9

Margaret Thomas's cases were taken from the wards of an isolation hospital, and the proportion of streptococci would naturally be higher than in cases taken from the ordinary maternity wards of a hospital.

King (1930) reporting 236 cases of puerperal infection gave the following figures :—

	Per cent
Streptococcus ..	.. 37.7
Streptococcus viridans	.. 6.3
Staphylococcus ..	.. 10.6

3. Obstetric shock is usually present.

4. Multiple vaginal examinations or attempts at delivery have been practised.

5. The case is usually terminated by means of an obstetrical operation.

The morbidity rate has, since 1935, decreased by approximately 5 per cent per annum and it is necessary to consider any factors that may have caused this reduction, having regard to our belief in 1935 that our technique was so standardized that we considered it unlikely to effect the morbidity rate, unless something new was introduced.

During the first 6 months of 1936, 10 c.cm. of concentrated anti-scarlatina serum were administered intramuscularly to all emergency cases admitted. The morbidity rate showed no improvement over the cases admitted during the second six months of the year and to which no serum was given. It was concluded that anti-scarlatina serum (10 c.cm.) was of no prophylactic value.

TABLE

Six-monthly abstract of morbidity cases

Period	EMERGENCY CASES			DUE TO GENITAL SEPSIS			Due to other causes
	Total number of deliveries	Total cases	Total morbid cases	Total	Normal	Abnormal	
		No. Per cent	No. Per cent	No. Per cent	No. Per cent	No. Per cent	No. Per cent
1935							
January to June ..	256	201 = 78.54	73 = 36.31	49 = 24.37	11 = 5.47	38 = 18.90	24 = 11.94
July to December ..	399	318 = 79.70	125 = 39.31	66 = 20.73	14 = 4.40	52 = 16.33	59 = 18.58
TOTAL ..	655	519 = 79.23	198 = 38.15	115 = 22.16	25 = 4.81	90 = 17.34	83 = 15.99
1936							
January to June ..	295	216 = 73.22	79 = 36.57	38 = 17.59	12 = 5.55	26 = 12.04	41 = 18.98
July to December ..	356	268 = 75.28	96 = 35.82	44 = 16.41	9 = 3.35	35 = 13.06	52 = 19.41
TOTAL ..	651	484 = 74.34	175 = 36.15	82 = 16.94	21 = 4.33	61 = 12.61	93 = 19.21
1937							
January to June ..	279	192 = 68.81	57 = 29.68	21 = 10.93	6 = 3.12	15 = 7.81	36 = 18.75
July to December ..	384	287 = 74.74	98 = 34.14	33 = 11.49	13 = 4.52	20 = 6.97	65 = 22.65
TOTAL ..	663	479 = 72.24	155 = 32.36	54 = 11.27	19 = 3.96	35 = 7.30	101 = 21.85

Commentary

There is a reduction of morbidity due to genital sepsis from 22.16 per cent (1935) and 16.94 per cent (1936) to 11.45 per cent in 1937 during which time proseptasine was given prophylactically. This reduction has occurred chiefly in the abnormal cases, which are of particular interest, and form a clinical group with the following characteristics :—

1. The membranes are ruptured and infection is potential or apparent.
2. The patient has been in labour from a few hours to a few days.

Since 1936 we have paid greater attention to vaginal lacerations as a cause of genital sepsis. Median episiotomy has also been more extensively practised since 1935. These additions in technique could easily account for the 5 per cent decrease in morbidity for 1936. We do not presume that the additional 5 per cent decrease in morbidity during 1937 was also due to the

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ON THE NECESSITY OF TEACHING THE FREQUENCY OF RHEUMATIC INFECTION IN YOUNG INDIANS

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1. *Historical note.*—Only of recent years has the fact of the occurrence of rheumatic infection amongst Indians become widely recognized. Indeed there are still some who do not recognize the existence of rheumatic fever in India at all, whilst perhaps the majority of medical practitioners in India would affirm that rheumatic infection occurs only rarely. It is mainly by the experience and teaching of the professors and lecturers of the medical colleges of India that this obscurity is now being dispelled.

As long ago as 1886, Norman Chevers in his classical *Commentary on the Diseases of India* remarked on the rarity of acute rheumatism in Bengal. 'The experience of a working life time', he writes, 'has taught me that acute rheumatism is rare in Lower Bengal'. He quotes Malcolmsen as having made a similar observation as regards Madras in 1835, 'The common acute rheumatism of Europe is very little known in India', but Morehead of Bombay remarked with greater vision that 'Acute articular rheumatism is not so common in India as in colder climates, yet it is by no means rare'.

Rogers (1910) wrote concerning 'the extreme rarity of rheumatic and scarlet fever in India, and specially in Bengal' and 'the great rarity of true acute rheumatic fever in India . . .'

Megaw (1910) wrote 'on the causation of heart disease in Europeans in India' and investigated two series of heart cases amongst Europeans and Anglo-Indians at the Presidency General Hospital, Calcutta. The first series consisted of 144 cases from 1906 to 1908 and contains 37 cases which were clearly rheumatic, of which 12 contracted their disease in India (4 in the hills and 8 in the plains) whilst 21 were contracted in Europe and 4 were doubtful. One case of chorea was admitted. The second series included 43 cases which Megaw personally investigated in 1909, of which 14 were clearly rheumatic and of which 4 only (one with chorea) were contracted in the plains of India. 'It seems safe to conclude that rheumatism of the type with which endocarditis is associated does definitely occur in the plains of India, but that it is much less common than in colder climates'.

Sir Leonard Rogers (1919) wrote 'Tropical countries differ in a remarkable way from temperate in the almost complete absence of rheumatic fever. Rheumatic fever does occur in hill stations in the Himalayas with European temperatures, but is scarcely ever seen in the hot plains. As a result of the absence of both rheumatic fever and scarlet fever heart diseases differ widely in their incidence. Other affections due mainly to syphilitic atheroma are very common, and organic diseases of the mitral valves proportionately rarer'.

Dr. Basu (1925), Teacher of Medicine, Calcutta Medical School, analysed 446 hospital and private patients examined by him from July 1919 to March 1925 and found (*a*) that 8 per cent of his total 446 cases, (*b*) that 57 per cent of his 28 cases of acute endocarditis, and (*c*) that 47 per cent of his 35 cases of chronic endocarditis were of rheumatic origin. On examining the details of his figures, these percentages certainly do not appear over-estimated. Dr. Basu added that mitral disease is rare, because rheumatic fever is rare in Bengal.

J. T. Clarke (1930), after an exhaustive study of available records, suggested that the disease is practically non-existent in the 'true' tropics. He confines his observations to the strict geographical tropics, and though he quotes the evidence of Calvert and Sutherland to the effect that they had seen rheumatic fever, chorea and nodules in Indian children, which conditions they regarded as rare, he disqualifies this evidence on the grounds of geographical limits. He further quotes Rogers as stating that out of 4,800

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additions in technique, as we feel that owing to the composition of the staff there was no increase in efficiency in 1937 as compared with 1935. We conclude that the 1937 improvement was due to the prophylactic administration of proseptasine. It is worthy of mention that both the medical and nursing staffs were impressed with the smooth clinical course run by many abnormal cases in which our clinical experience led us to expect complications.

Toxicity.—No ill effects have been observed as a result of the administration of proseptasine. We have administered up to 250 tablets (125 grm.) without signs of toxic symptoms.

Dosage.—The manufacturers recommended 2 tablets (1 grm.) three times daily. We were frankly sceptical as to the possibility of this amount being adequate to produce efficient bactericidal action in the blood. Double the dose produced no improvement in results, and we suggest that much larger doses are indicated.

Although a reduction of 5 per cent is not very striking, we feel that it is encouraging enough to advocate further investigation with very much increased dosage.

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post mortems in Calcutta only one showed rheumatic carditis.

Sir Leonard Rogers wrote (Rogers and Megaw, 1930):

Deaths from circulatory diseases in the Indian series are just one half of those in the London one. The essential cause of this great difference is the remarkable absence of rheumatic fever and its sequelæ amongst Bengalis. In 4,800 Calcutta post mortems over 37 years only one death was returned as due to rheumatic endocarditis, and that was in an Anglo-Indian who had probably visited a cold climate; there was also only one case of possible rheumatic pericarditis. Moreover, among several thousand specimens in the Calcutta pathological museum accumulated during eighty years, there is only one described as rheumatic endocarditis in an Indian subject and that may well have been of pneumococcal or septic origin, as during twenty years' post-mortem experience the writer found all his endocarditis cases to be due to that class of organism. It may therefore be held that reliable evidence of the occurrence of rheumatic endocarditis in Bengal is still lacking. My collaborator, J. W. D. Megaw, agrees that rheumatic endocarditis is much less common than in Europe, but is by no means rare in Lucknow and not infrequent even in some places where the winter season is not really cold.

In 1923, I became interested in this question, soon after being appointed as physician to King George's Medical College Hospital. During the following years a large number of cases of mitral stenosis amongst young Indians, mostly with congestive heart failure, were admitted to the medical wards. It was the *cause* of this not uncommon mitral stenosis which first aroused my interest. In personal discussion with responsible teachers from medical colleges of all provinces of India and with Indian practitioners and civil surgeons of long experience, I found uniform agreement that undoubtedly definite clinical cases of acute and subacute rheumatic infection did occur in Indian children and young adults, and that the cause of mitral stenosis in India, as in England, was preceding rheumatic infection. Lieut.-Colonel Sandes, I.M.S., Professor of Medicine and Physician to Medical College Hospitals, Calcutta, told me he frequently recognized acute and subacute rheumatic infection in young Indians in his wards in Calcutta.

In 1930 one series of observations was published in this journal under the title of 'On rheumatic infection as a cause of mitral stenosis amongst young Indians'. In that article, I concluded, from my personal experience, in the following words :—

(1) Congestive heart failure following mitral stenosis is quite common in young Indians between 12 and 18 years of age in the United Provinces.

(2) Acute articular rheumatic fever does affect young Indian adults.

(3) Some acute rheumatic fever cases are observed to progress to peri- and endocarditis.

(4) Subacute rheumatic infection (carditis) was more difficult to recognize in Indian children even than in European children, for such children were not often brought to doctors and doctors have not been so far fully taught of its occurrence.

(5) Irreparable advanced mitral disease and congestive failure in young Indian adults is an index in India, as in England, of preceding unrecognized subacute rheumatic infection.

(6) Other possible causes of the common mitral stenosis in young Indian adults could be eliminated, *e.g.*, (1) congenital abnormality, (2) degenerative diseases, and (3) other infections (streptococcal, pneumococcal, scarlet fever, influenzal, syphilis, etc.).

(7) The impression amongst those who had considered the typical world distribution of rheumatic fever (*i.e.*, in cold damp climates) that rheumatic infection would not exist in warm climates such as India cannot be upheld.

Professor Hughes and Yusuf (1930) of the K. E. Medical College, Lahore, wrote 'Heart affections are met with much less often in tropical and in sub-tropical countries than in temperate regions, the difference being largely accounted for by the rarity of rheumatic fever in the former'. (Both these remarks may, in 1937, be considered open to revision.—H. S.) 'This fever probably varies in incidence and type in different parts of the tropics. In the textbooks of tropical medicine it receives little or no attention'. Hughes then describes 35 heart cases, 31 of which were treated in the Medical College Hospital, Lahore, between 1st October, 1929 and 30th April, 1930, being 5.6 *per cent of the total admissions* to those medical wards, all except one being a Punjabi Indian. Nineteen of the 31 cases had mitral stenosis. The Wassermann reaction was negative in all except two cases, with aortic regurgitation. In five mitral cases, subacute multiple arthritis existed and 13 gave a history of painful swollen joints. Gonorrhœa, syphilis and other specific causes were excluded as far as possible. Hughes concludes :

In the Punjab, heart lesions, especially of the mitral valve, often bear an ætiological relationship to a disease in certain respects resembling rheumatic fever of temperate climates. This disease shows some or no heart signs with a strong tendency to relapse. Sometimes successive attacks of arthritis are followed by mitral lesion. Some patients complain of rheumatic attacks for years before they come under observation. Unhealthy tonsils occur. The joints swell and become tender, sometimes abruptly, with some fever (102° or 103°) and subside quickly after two or three days. More often the joints swell and subside slowly. Usually there is little fever. The ankles, knees and wrists are most often affected, usually with some stiffness. Response to salicylates was not marked. No cases of rheumatic nodules or of chorea were seen. In short, the mitral disease of these patients seems to be an infection generally subacute or chronic which like rheumatic fever affects the heart or the joints or both together. Whether it is actually a variety of rheumatic fever it is difficult to say, but it is obviously an analogous condition. Possibly it also caused the aortic disease in three cases in which the mitral valve also was affected.

In 1931 Professor Hughes and Yusuf became more definite. Referring to the 1930 series they then wrote :

Attention was drawn to the fact that in the Punjab rheumatism is an important cause of valvular heart disease, especially of mitral stenosis. Although most frequent in pubescents and young adults it resembles the rheumatic fever of children in temperate climates. Acute arthritis is seldom seen, the disease usually taking a subacute or chronic course with a strong relapse tendency. In some cases with typical heart lesions the history indicates little or no involvement of the joints and in these the cardiac condition is

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generally either discovered in routine examination or escapes detection until compensation fails. The joints most frequently attacked are the ankles, knees, wrists, elbows and small joints of the hands and feet but almost any joint may be affected. In the more acute cases especially, the disease first appears in one or two joints and spreads to others a day or so later. We have not seen rheumatic nodules or chorea in any patient, but tonsillitis is sometimes present.

Professor Hughes further now reports the occasional occurrence of uncomplicated aortic regurgitation of rheumatic origin. The two patients were 18 and 21 years old, with well-marked aortic incompetence who gave typical histories of rheumatism but showed no mitral lesion. They were admitted for lobar pneumonia and for malaria, respectively, and the aortic lesion was found only on routine examination. There were no complaints of cardiac trouble; blood pressure 115/40 and 132/50. Wassermann reaction was negative in both cases. The occurrence in India of uncomplicated aortic regurgitation of rheumatic origin was thus substantiated.

Lieut.-Colonel Hodge (1932), now Professor of Medicine, Medical College, Calcutta, reported fourteen selected cases of rheumatic fever from Bengal :

> In Bengal the incidence of rheumatic fever is generally accepted. The writer has seen a number of unmistakable cases of rheumatic fever in Chittagong, Chinsura and Darjeeling and Jalpaiguri. Twelve cases are quoted—12 being in children 5 of whom showed chorea and 2 pre-choreic symptoms.

In 1932-33 some ten letters appeared in the correspondence columns of the *British Medical Journal* on 'Acute rheumatic infection in the tropics' (Clarke, Hughes, Keates, Mackinon, 1932), (Clarke, Ross, Dutton, 1933).

The evidence of those against its occurrence carried little weight. Three quotations are appended : (1) 'Twenty-five years of civil surgeoncy in the Punjab has convinced me that rheumatic infection is practically non-existent amongst the indigenous population. If rheumatic fever were at all prevalent, surely one would see cases of mitral disease. I have never seen a case of primary disease of the mitral valve. In 600 post mortems at Amritsar I never saw any evidence of inflammation of the mitral valve'. (2) Rheumatic fever is a disease of temperate climates, and even if I am incorrect in saying that none occurs in the tropics, it is so rare there that I have no doubt that some special difference between temperate climate countries and the tropics will ultimately give the clue which should help to elucidate the cause of this disease'. (3) 'A transfer to the tropics seems to be the best though unfortunately an expensive treatment for rheumatic fever'.

On the other hand, this correspondence produced letters of weight from Lieut.-Colonel Hughes, Professor of Medicine, Medical College, Lahore, and from Lieut.-Colonel Dutton, Principal and Professor of Medicine, Medical College, Patna.

Lieut.-Colonel Hughes wrote :

> There is no doubt whatever that (1) at present rheumatic fever whilst not prevalent is by no means uncommon amongst the indigenous population of the Punjab, and (2) that mitral disease is a frequent result of rheumatic infection. I have heard from a colleague of two patients with rheumatic chorea in the same Indian family who both suffered from mitral disease as well. One died of cardiac failure. At the Medical College, Lahore, mitral disease occurred seven times (3.5 per cent) in 200 consecutive post mortems.

Lieut.-Colonel Dutton (1933) wrote :

> Experience of my ward cases showed that typical acute rheumatism, rheumatic endocarditis and chorea were quite numerous during the cold weather and reacted to appropriate anti-rheumatic treatment. Many children were admitted with typical rheumatic endocarditis which developed into mitral stenosis, proved later by post mortem. A considerable number of chorea cases were admitted and cured by anti-rheumatic treatment only. There is no doubt whatever in my mind that acute rheumatism with endocarditis is almost as common in India during the cold weather in those provinces which have really cold weather as it is in any temperate climate.

From Vizagapatam, Madras, Kutumbiah (1935) and from Calcutta Banerjea (1935) have published their series of cases of rheumatic heart disease.

Gunewardene (1935) wrote in his *Heart Disease in the Tropics* : 'There is overwhelming clinical evidence that rheumatic fever and its complications are certainly met with in the tropics. In a paper read before the Ceylon Branch of the B. M. A. recently Dr. Cyril Fernando gave notes of 40 cases of rheumatic fever in Ceylon showing convincing evidence that all the usual sequelæ of rheumatic fever are met with in the tropics'.

In 1936 from Miraj in the Bombay Deccan, *i.e.*, well within the true tropics, Dr. Carruthers (1936) of the American Presbyterian Hospital published an excellent study of rheumatic heart disease in Bombay Deccan.

Dr. Carruthers reported his experience at Miraj, Bombay Deccan, and concluded that :

1. Rheumatic fever, as shown by the presence of rheumatic heart disease, although not as prevalent as in other parts of the world, nevertheless is a common condition (in Indians) in the Bombay Deccan.
2. The percentage of heart disease that is rheumatic in origin is greater than in other parts of the world.
3. There would seem to be a slight but definite tendency to a later age of onset in rheumatic heart disease in the Deccan (*see* table).
4. The percentage of rheumatic heart disease without clinical evidence of rheumatic fever is no greater in the Deccan than elsewhere.

Carruthers' 100 heart cases were admitted over the two years 1933-35 forming 5.08 per cent of the total 1,967 medical admissions. Forty-seven per cent of the heart cases were of rheumatic origin, forming 2.44 per cent of the medical admissions.

In Kutumbiah's Vizagapatam series 43.2 per cent and in Banerjea's Calcutta series 33.2 per cent resulted from rheumatic disease.

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The age of onset is shown in the following table compared with Cabot's (1926) English figures :

	Bombay Deccan	England
Below 10 years ..	8 or 17.02 per cent	45 or 18.8 per cent
,, 20 ,, ..	21 or 44.68 ,,	125 or 52.3 ,,
,, 30 ,, ..	31 or 68.68 ,,	172 or 72.1 ,,

Of the 47 Deccan cases, 36 were males and 11 females. The table shows a slight but definite tendency to a later age of onset in India*. Of the Deccan cases, 74 per cent gave a definite history of joint pains and 25 per cent showed these in hospital. There were no choreas. Thirteen or 27 per cent died in hospital, and 7 had autopsies, six showing mitral sclerosis.

Finally in 1937 a note on the prevalence of acute rheumatic infection and of rheumatic endocarditis in India was required for the Office International d'Hygiene Publique to be held in Paris in October 1937, to which end the Public Health Commissioner with the Government of India sought information from the provincial directors of public health and from the annual provincial hospital returns. I had the privilege of reading their replies, which may be thus summarized : Official public health opinion holds that acute rheumatic fever and acute rheumatic endocarditis do exist all over India, but the official opinion is still, with few exceptions, that the prevalence of rheumatic fever is 'rare' or 'very rare'. The medical returns from civil hospitals under 'acute rheumatism' are utterly unreliable since fibrositis, myalgias, arthritis, and many joint conditions, both acute and chronic, are all almost invariably dumped indiscriminately under this head.

2. *Incidence.*—The comparative prevalence of rheumatic fever between India as a whole and other countries, *e.g.*, England, and between the different provinces and areas of India in the present absence of sufficient diagnosis and of accurate statistics is naturally difficult to determine. Statistics for admission to the hospitals of medical colleges and schools and statistics of post mortems done in such teaching institutions would provide the most reliable figures available. Allowance however must be made for 'tropical diseases' which swell the 'total' medical admissions for all causes, and the 'total' post mortems performed in India and which do not of course influence European statistics. The rheumatic fever admission rate and the post-mortem rate in India would be greatly reduced as compared with those of non-tropical countries.

About one-tenth of the total medical admissions and about one-third of total post mortems performed in medical college hospitals are for 'tropical diseases'. Even with this allowance, the figures indicating the true rheumatic fever prevalence rate would be higher in India than those returned because it is only comparatively recently that the not uncommon prevalence of rheumatic fever in India is being recognized, and also because subacute rheumatic infection in Indian children is so difficult of diagnosis. After all it is only comparatively recently in England that the diagnosis and frequency of early rheumatic infection has been clarified.

3. *The stenosis rate or the mitral rate as an index of rheumatic infection.*—The admission rate for acute rheumatic fever or for acute rheumatic carditis (endo- or peri-, or both) only is often regarded as an index of the prevalence of rheumatic infection. But a more reliable index and one easier to obtain is the hospital admission rate for mitral stenosis or for primary mitral disease (stenosis and regurgitation) or for heart failure from mitral disease specially under 30 or 40 years of age. From such primary-mitral-disease figures all cases secondary to aortic disease and degenerative arteriosclerotic lesions, or to myocardial degeneration are of course excluded. At least 95 per cent of all cases of mitral stenosis and probably also of primary mitral disease under 30 or 40 years are due to preceding rheumatic infection. Mitral stenosis or primary mitral disease as an index of preceding acute rheumatic infection is just as reliable an index, or even more so, than is the spleen rate as an index of preceding acute malaria. Such a standard might be well known as the 'stenosis' or mitral rate of rheumatic infection. Such a 'stenosis' rate would include cases due not only to acute but also to subacute and to chronic preceding rheumatic infection.

The post-mortem diagnosis of mitral stenosis, or of mitral valve disease, under 30 or 40 years of age, at the various medical schools of India is reliable, and the proportion of mitral stenosis cases furnishes some rough guide as to the frequency and distribution of acute rheumatic infection. From such statistics those due to tropical diseases have to be excluded when dealing with countries in which tropical diseases are not endemic.

4. *The post-mortem incidence of acute rheumatic infection and of mitral disease post mortems at Indian Medical Colleges.*—In 1925, I collected and analysed the statistics of 10,937 post mortems performed up to that date in the medical colleges of India (Calcutta, Patna, Lucknow, Lahore, Bombay and Madras), with Rangoon and Colombo as representatives of the Near East, also of 4,130 post mortems from the medical colleges of Hong Kong, Singapore and Java as representatives of the Far East, and compared them with 4,378 post mortems from Guy's and St. Mary's Hospital, London, whilst Dr. Ophuls, Professor of Pathology at Stanford University, San Francisco, U. S. A., was good enough to provide me with a comparative series of 3,912 post mortems to indicate the American

*This difference would not satisfy any statistician.—EDITOR, *I. M. G.*

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figures. From the Indian and 'Far East' American figures all tropical diseases, *i.e.*, diseases not occurring in England, were excluded, so that some rough comparison becomes possible as to the incidence of rheumatic and of primary mitral diseases amongst these 19,659 post mortems.

The following table indicates that rough comparison but obviously too great importance should not be attached to such figures. They can only serve as some basis for further investigation and discussion.

TABLE I

Post-mortem diagnosis	In the Medical Colleges of				Totals
	India, Rangoon and Colombo	Hong Kong, Singapore and Java	London: Guy's and St. Mary's	San Francisco, U. S. A.	
1. Rheumatic endocarditis	60	0	119	1	180
2. Mitral disease	145	25	43	56	269
3. (1 + 2)	205	25	162	57	449
4. Total post mortems less 'tropical' ..	8,568	3,027	4,378	3,786	19,759
5. Percentage of 3 to 4	2	0.8	4	2	2.2

So far as the figures go, it would appear that post mortems are done for rheumatic endocarditis and for mitral disease combined twice as frequently in London as in India and San Francisco, and four times as frequently as in Hong Kong, Singapore, and Java. There are however obvious fallacies: (1) Although tropical diseases are excluded from the Indian series, yet undoubtedly such diseases do influence the frequency. (3) Whereas most cases dying in hospital are post-mortemed in London, only 'unclaimed' bodies can be post-mortemed in most medical colleges in India. However, these figures are the most accurate at present available.

If the percentage frequency of rheumatic and of mitral disease combined is worked out on the post mortems performed for deaths from circulatory system disease (which probably gives a true figure) the percentage for India and for London is precisely similar (*vide* Table II).

Moreover, if the figures for India and for London be further analysed (*see* table III), the interesting inference can be drawn that in India possibly preference is given to diagnosis of 'mitral disease' rather than to one which more definitely indicates the probable causative factor.

The American figures of post mortems for circulatory disease include a very large number

TABLE II

Post-mortem diagnosis	In the Medical Colleges of				Totals
	India, Rangoon and Colombo	Hong Kong, Singapore and Java	London: Guy's and St. Mary's	San Francisco, U. S. A.	
1. Rheumatic endocarditis	60	0	119	1	180
2. Mitral disease	145	25	43	56	269
3. (1 + 2)	205	25	162	57	449
4. Total post mortems 'circulatory diseases' ..	807	49	631	1,255	2,742
5. Percentage of 3 to 4	25	50	25	2	14

post-mortem figures, *e.g.*, many cases are diagnosed post mortem as anæmia (which is not excluded) and many of these are probably due to ancylostomiasis and to malaria. (2) The post-mortem figures are previous to 1925; since then in India the knowledge of the prevalence of rheumatic fever has increased and this knowledge may to some extent influence the diagnosis due to arteriosclerosis, atheroma and other degenerative cardiovascular diseases, so that a comparison becomes difficult.

It is of some interest to examine the relative frequency of rheumatic and mitral post mortems at the different Indian medical colleges. These are set out below (table IV), but here again too much reliance should not be placed on

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TABLE III

Post-mortem diagnosis	India, Rangoon and Colombo		London: Guy's and St. Mary's	
	Actuals	Percentage of circulatory post mortems	Actuals	Percentage of circulatory post mortems
1. 'Rheumatic' mitral disease	60	7	119	18
2. Mitral disease	145	18	43	7

deductions drawn from them. Further investigation is required.

As judged by these post-mortem figures, the order of frequency of post mortems for combined rheumatic endocarditis and mitral disease is low-lying areas near the sea coast or rivers, especially where liable to floods, and during heavy rains, *e.g.*, in the hills during the monsoons when rain falls and the diurnal range of temperature is maximal. Damp clayey soils for

TABLE IV

Post-mortem diagnosis	In the Medical Colleges of								Totals
	Calcutta	Patna	Lucknow	Lahore	Bombay	Madras	Rangoon	Colombo	
1. Rheumatic endocarditis ..	0	0	1	0	25	9	2	23	60
2. Mitral valve disease ..	10	0	7	14	22	25	12	0 (?)	90
3. (1 + 2)	10	0	8	14	47	34	14	23	150
4. Circulatory post mortems	112	1	18	27	176	319	84	70	807
5. Percentage of 3 to 4 ..	9	0	44	50	27	11	17	33	26
6. Total post mortems (excluding 'tropical').	1,052	137	145	303	2,498	2,702	1,114	617	8,568
7. Percentage of 3 to 6 ..	1	0	5	5	2	1	1	4	2

(1) Lahore, (2) Lucknow, (3) Colombo, (4) Bombay, (5) Rangoon, (6) Madras, and (7) Calcutta. If the Guy's and St. Mary's London figures (25 per cent + 4 per cent) were added they would be placed fourth or fifth after Colombo or Bombay.

5. *The importance of rheumatic infection.*—This lies not in the initial attack, nor in the relapses, but in the gradual progressive fibrosis of the mitral valve which so often follows and which kills the young Indian patient in his late teens or early twenties. Three questions of practical importance arise: What are the ætiological factors? Why are more cases of rheumatic infection not diagnosed? What steps are required to improve the diagnosis?

6. *Ætiological factors in acute rheumatic infection.*—The available figures are not yet sufficiently scientific nor numerous in India to decide with reference to such ætiological factors as sex, caste or area of frequency. There seems little doubt however that as in Europe the incidence falls far more heavily on the poor and especially on those ill-nourished and debilitated by previous disease and infection. Moreover, the incidence may be expected to be greater (as elsewhere throughout the world) in cold and damp seasons, areas and dwellings, *e.g.*, in obvious reasons also predispose. Dry hot areas (*e.g.*, near the Sind desert) may be expected to furnish a low incidence. More direct predisposing conditions are pharyngeal catarrhs, recurrent tonsillitis and exposure to chill by permitting the causative germ of rheumatic infection to enter the system through this portal. Adequate preventive measures are thus indicated: good dry warm housing, climates, soils and clothing, good food and physique, a healthy nasopharynx and a sufficient income. On theoretical grounds some believed that rheumatic infection would be rare in the tropics because heat and its attendant perspiration are preventive and curative. A well-recognized ætiological factor is damp cold *plus* a draught which produces a 'chill'. Dry cold is not a usual precursor unless there be a chill of exceptional severity. But in India sudden chills after free perspiration are very common. A great draught in conditions of great humid heat and great perspiration, but with little fall in general atmospheric temperature, will produce an individual chill as readily as a lesser draught with lesser heat and perspiration with a considerable general climatic fall in temperature.

7. *Why are more cases of rheumatic infection not diagnosed?*—Some reasons why more

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cases are not diagnosed in Indian children are: (1) The existence and prevalence of rheumatic fever in India have only recently been generally recognized, and in fact is even now questioned and at times denied by some outside medical teaching colleges and schools. Even now, most authorities speak of it as 'rare' or 'very rare'. (2) The general unwillingness of Indian families to bring their children or young adults to hospital and to leave them in hospital without relatives, and that for an apparently trivial illness which in its subacute form displays only moderate fever with limb or joint pain and not those with striking and dramatic symptoms which are typical of some diseases with which Indian families are readily familiar, *e.g.*, cholera, tetanus, rabies, etc. Parents are not alive to the serious cardiac conditions which may not infrequently arise. (3) The want of special accommodation and of special physicians for children's diseases in India, *e.g.*, the comparative absence of children's beds, of children's wards, of children's hospitals, and of special out-patients for children with physicians specializing only in children's diseases, not only in the hospitals attached to medical colleges and schools (where they are essential) but also in time in all civil, Dufferin and private hospitals. (4) The diagnostic difficulty. Moderate fever for a week or two even with severe joint, limb or heart pain is not recognized as serious in a country where severe fever often with severe febrile pains is of daily occurrence. (5) The want of better teaching by children's specialists in Indian medical colleges and schools, both under-graduate and post-graduate. Hence, the present generation of medical men, whether of degree or licentiate standard, is not as fully trained as they should be in the diseases of children.

8. *Steps required to improve diagnosis* may be mainly summed up within the two words, education and provision, *e.g.*—(1) Information to medical officers in Government service, by circulars from the administrative medical officers and through their post-graduate classes, and to private practitioners, by articles to the medical press and by papers read before medical associations and societies. (2) Special attention by the school medical service and medical inspection of school children. (3) Teaching by specialists in the diseases of children to all medical students in their curriculum as now laid down by the Medical Council of India. (4) A definite quota of questions on children's diseases in all parts of the appropriate qualifying examination papers and *viva voce*, *e.g.*, in medicine, pathology, hygiene, obstetrics and surgery. (5) Instruction to nurses, preparing for the Nursing Certificate examinations of the provincial State Medical Boards. (6) The general public information concerning the occurrence and prevalence of rheumatic infection and of its sequelæ, through the public health services, the Red Cross, women and child welfare centres, with their health visitors and midwives, with lectures to the educated public and especially to mothers through such agencies. (7) By providing special children's hospitals, wards, beds and out-patients in all medical colleges and medical school hospitals and as soon as possible in all hospitals and dispensaries. (8) A revised and more accurate nomenclature in diagnosis and the annual hospital returns, *e.g.*, not 'acute rheumatism', which might reasonably include acute lumbago or acute sciatica, but 'acute rheumatic' infection, to include acute rheumatic fever (polysynovitis), acute rheumatic carditis (peri- and endo-), rheumatic chorea, and nodules and chronic rheumatic mitral disease.

Summary

1. Recent views concerning the occurrence of acute and chronic mitral rheumatic infection in India are reviewed.

2. The experience of teaching physicians attached to medical college hospitals that such infection most certainly occurs in all its forms and is not uncommon is noted.

3. In comparing the incidence of rheumatic infection in India and Europe, and throughout India, the most reliable standards would be (*a*) the hospital admission, (*b*) post-mortem rates of the Indian medical colleges and schools, and (*c*) the clinical experience of their attached physicians.

4. Allowance must however be made for tropical diseases which affect the Indian as compared with European admission and post-mortem rates.

5. A stenosis rate or mitral rate is suggested as a more reliable index for the incidence of rheumatic infection than an admission rate for acute rheumatic polyserositis or carditis.

6. Amongst 10,937 post mortems from the medical college hospitals of India the incidence for acute and chronic mitral endocarditis combined was 2.2 per cent of the total post mortems and 14 per cent of the post mortems for total circulatory diseases.

7. If the post-mortem rate for rheumatic mitral (7 per cent) disease and for primary mitral disease (cause unspecified) (18 per cent) be added together the same figure is reached for India as in London post mortems (18 per cent for rheumatic and 7 per cent for unspecified). It would therefore appear in India that primary mitral disease (of young adults) is not so far recognized as being mainly due to rheumatic infection.

8. The relative order for acute rheumatic infection and for mitral disease as judged by those 1925 figures at the Indian medical colleges is (1) Lahore, (2) Lucknow, (3) Colombo, (4) Bombay, (5) Rangoon, (6) Madras, and (7) Calcutta. But future investigation will make large differences in these figures.

9. The importance and ætiology of rheumatic infection is briefly referred to.

(*Continued at foot of opposite page*)

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POST-ARSPHENAMINE BLOOD DYSCRASIAS

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BLOOD dyscrasias as a result of modern anti-syphilitic treatment are relatively rare and grave complications. The literature on the subject is scanty. Folley and Moore claim to have described the first case in the American literature. McCarthy, Loveman and Wilson have recorded seventy cases in their special study on the subject. In general, blood dyscrasias following the administration of arsphenamines are characterized by the symptomatic and pathological expression of depressed bone-marrow function, the type of reaction depending upon the type of injury and the particular elements affected. Piney's (1931) hæmatological studies have confirmed the fact that a condition resembling agranulocytosis produced by benzol poisoning is rarely caused by salvarsan and similar substances. The following figures are quoted by Moore (1933) to show the relative frequency with which each preparation of arsenic produces this group of toxic reaction :—

Arsphenamine	..	10 cases
Neo-arsphenamine	..	43 „
Sulpharsphenamine	..	14 „
Silver-arsphenamine	..	1 „

Aubertin, Blancstein and Lehmann have observed two cases of agranulocytosis in syphilitic patients after treatment with acetylarsan. These patients according to their report had also severe anæmia. No cases have been so far reported with tryparsamide. Though the above figures show that the neo-arsphenamine group produces the greatest number of blood reactions, it is considered by the Council of Pharmacy and Chemistry of the American Medical Association that sulpharsphenamine is the worst of the offending agents.

Clinically four different types of reactions are described :—

1. Symptomatic purpura.
2. Thrombocytopœnic purpura.
3. Agranulocytosis.
4. Aplastic anæmia.

There may occur a combination of these syndromes. The frequency of each type is shown by the following figures in the reported cases :—

Thrombocytopœnia	..	12 cases
Thrombocytopœnia with agranulocytosis	..	7 „
Agranulocytosis	..	15 „
Aplastic anæmia	..	36 „

This depends upon the degree of damage to the thromboplastic, leucoblastic and erythroblastic tissues, respectively. In the severe type of aplastic anæmia the hæmopoietic activity of the bone marrow is completely suppressed and all the formed elements are thereby involved.

The clinical picture of thrombocytopœnia is essentially one of purpuric hæmorrhages from the skin, mucous membrane and viscera. Blood platelets are markedly diminished. The other elements are usually not affected. Recovery is said to be the rule.

In the other type of cases with granulocytopœnia, fever, and soreness of the throat, with or without necrosing ulcerations of the bucco-pharyngeal tissues, are the usual signs. A blood count reveals the marked fall of leucocytes caused by an absolute granulocytopœnia. Very low figures down to 136 per c.mm. are reported. Other septic complications may set in with lethal termination. In cases associated with platelet deficiency purpuric hæmorrhages and visceral hæmorrhages may complicate the picture. Usually the anæmia associated with this group of disorder is slight and non-progressive. The gravest of all the types is aplastic anæmia. Progressive anæmia is evident from the onset in addition to thrombocytopœnia and agranulocytic symptoms. The course is downhill. Blood shows a progressive and often rapid

(*Continued from previous page*)

10. Some steps required to improve the recognition of the prevalence of rheumatic infection are detailed.

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reduction of all the elements. The aplastic nature of hæmopoiesis is well demonstrated by examination of bone-marrow smears.

It has been generally observed that blood changes occur late in the course of treatment. Moore is of opinion that excessive dosage plays no apparent rôle. The prognosis is rather grave in all this group of reactions. Aplastic anæmia is attended with the highest mortality (80.5 per cent) while death due to thrombocytopœnia has not been recorded so far. It is surmised that the probability of survival is in direct proportion to the extent of damage to the bone marrow.

Regarding the mechanism of production of blood dyscrasias by arsphenamines, it is thought that the benzene radical is the toxic factor. The latter is supposed to exert a direct inhibitory action on the bone marrow, which may explain the leucoblastic and erythroblastic reactions. The acute onset of thrombocytopœnia, however, has led to the suggestion that the platelets are directly destroyed while in the peripheral circulation. Another explanation that may be considered plausible in this connection is that perhaps similar to benzol, arsphenamines exert toxic action first on the megakaryocytes much earlier than on the leucoblastic and erythroblastic elements. That these complications are due to the drug administered are also shown by the fact that sometimes regeneration of the different tissues and elements occurs on the withdrawal of the toxic agents.

Why is it that in only a few patients the bone marrow succumbs and shows hypoplastic or aplastic manifestations, though all under treatment are exposed to the same type of poison? This has led to the suggestion of a constitutional predisposition as the determining factor. In the opinion of Voegtlin quoted by Hamilton no explanation of these cases other than a peculiar idiosyncrasy can as yet be given. Still another view shared by Whitby and Britton (1935) is of a congenital deficiency of bone marrow in such cases.

With this short review, as a preamble, three cases are reported for discussion. The following three cases occurred in the venereal department of the General Hospital, Madras, from 1931 to 1937. These are the only three cases that have been observed so far :—

Number of cases of syphilis treated in the department from 1931 to 1937 ..	18,620
and	
Number of injections of arsenicals given during the same period	64,101

Case 1.—A male, aged 22, attended the venereal out-patient department, on 22nd July, 1933, for late secondary syphilis. Blood Kahn and Wassermann reaction were both strongly positive. Weekly injections of neo-salvarsan and hypoloid bismuth were started. He had a total of 0.95 gm. of neo-salvarsan and 3 c.cm. of hypoloid bismuth. He took the last injection on 7th August. On 9th August, he was admitted as an in-patient in the venereal department for bleeding per rectum, epistaxis and bleeding from the gums. His general condition was fair. Both the conjunctivæ were congested. There were no purpuric spots on any part of the body. The motions were tarry. Urine—normal.

Blood count showed the following:—

Red blood cells ..	4,650,000	per c.mm.
White „ „ ..	8,125	„
Differential count:—		
Polymorphonuclears ..	64.0	per cent
Lymphocytes ..	24.6	„
Mononuclears ..	8.6	„
Eosinophils ..	2.8	„

Blood platelets—14,762 per c.mm. He was given calcium thiosulphate 10 c.cm. of 10 per cent solution intravenously and ½ c.cm. of 1 in 1,000 adrenaline daily. Bleeding from the gums stopped after two days. He was given also 20 c.cm. of horse serum intravenously and 20 c.cm. intramuscularly. He was discharged on 24th August at his request. No further arsenical injections were given to him. The platelet counts on successive days were as follows:—

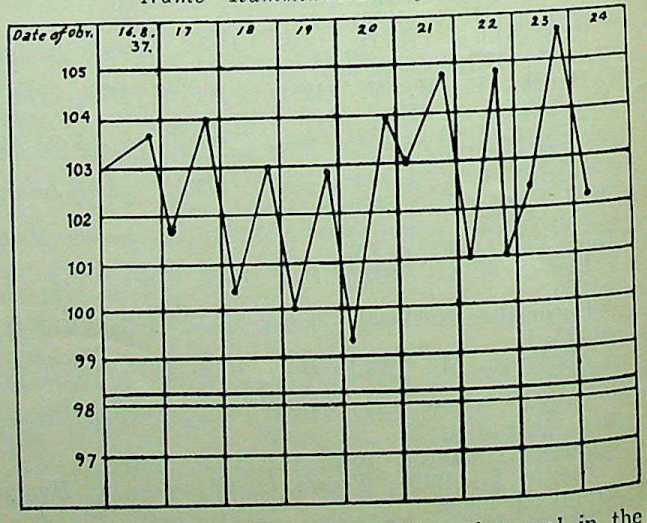
10-8-1933	12,500	per c.mm.
11-8-1933	20,000	„
12-8-1933	20,000	„
13-8-1933	20,000	„
14-8-1933	20,000	„
16-8-1933	50,000	„

Case 2.—A male, aged 25, attended the venereal out-patient department, on 25th April, 1937, for multiple penile sores which he developed five days after exposure to infection. Dark-ground examination was repeatedly negative for the *Spirochæta pallida*. Both Wassermann reaction and Kahn of the blood were repeatedly negative, even after 0.3 gm. neo-salvarsan provocative injection. He was given gradually increasing doses of Dmelcos vaccine intravenously, starting from 1 c.cm. There was no improvement of the condition. Later Fouadin was tried and he had 51 c.cm. in all, again with no improvement. In spite of the negative dark-ground and serology, anti-syphilitic treatment was started on 28th June. He had a total of 12 injections (36 c.cm.) of acetylarsan twice weekly and four weekly injections (4 c.cm.) of bismostab. The ulcers were healing under this regime of treatment. The last injection was given on 10th August.

On 16th August he sought admission on the medical side for fever and bleeding from the gums—eight days' duration. Condition on admission—temperature 103.8°F., pulse 110 and respiration 28 per minute. Chart 1 shows the course of the temperature. Blood

CHART 1

Name—Ramchandra. Age—25.



pressure 110/58. There was nothing abnormal in the other systems. The temperature showed a steady rise up to 105°F. on 23rd August. Bleeding from the gums

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became worse, the general condition became progressively low and on 23rd he expired. There were no lung signs or throat ulceration. The following table shows the blood changes and treatment adopted:—

TABLE

Date	Red blood cells in 10^6 per c.mm.	White blood cells: Total and differential count	Blood platelets per c.mm.	Treatment
19-8-37	3.1	Marked leucopœnia. Relative lymphocytosis. Few immature granular leucocytes.	56,250	
21-8-37	2.21	1,000 { Poly. .. 14 per cent; Lympho. .. 86 „	..	Campolon 2 c.cm. intramuscularly. Adrenaline 1 in 1,000, b.d. Calcium chloride 3 grains intravenously. 1 c.cm. 5 per cent sodium nucleinate.
22-8-37	2.24	800 { Poly. .. 13.3 „; Lympho. .. 86.7 „	72,000	Cold sponging. Nucleic acid, campolon and adrenaline as before. 10 c.cm. 10 per cent sodium thiosulphate intravenously.
23-8-37	1.9	1,000 { Poly. .. 8 „; Lympho. .. 92 „	..	Treatment as before and 10 c.cm. pentose nucleotide (Evans) intramuscularly.

Other laboratory reports.—The hæmoglobin was 50 per cent and the reticulocyte 0.3 per cent; there was no blood in the fæces, and the urine was normal, and the van den Bergh negative.

Bone-marrow smear.—The sternum was trephined and smears were made from the marrow. Marked absence of leucoblastic elements. Very few myelocytes and lymphocytes. No evidence of any active regeneration of erythropoietic elements. Blood transfusion was not done in this case. No post mortem was done.

Case 3.—A male, aged 46, attended the venereal out-patient department on 2nd August, 1937, with a primary syphilitic sore of 20 days' duration. Blood Wassermann reaction strongly positive. There was nothing of significance in the previous history. He had 0.45 gm. neo-salvarsan intravenously once in five days and weekly injections of 1 c.cm. of bismostab. He received a total of 3 gm. of neo-salvarsan and 4 c.cm. of bismostab. The sore was responding well. The last injection was given on 6th September.

He was suddenly taken ill on 11th September with intense malaise, shivering attacks, bleeding from the gums and severe headache. On admission he was looking definitely ill and presented a puffy face. Temperature 103.6°F., pulse 100, and respiration 30 per minute. Tongue was coated and throat congested. There was no ulceration of the throat. Moderate bleeding from the gums which were markedly swollen and inflamed. Examination of the other systems revealed nothing abnormal. Chart 2 shows the course of the temperature. Blood pressure—70/54. Bleeding and prostration were progressive. Later, he developed pneumonic signs and expired on the 14th September. There was neither throat lesion nor hæmorrhages from other parts of the body than the gums, palate and conjunctivæ, throughout the course of the illness. Blood examinations and the treatment adopted are summarized in the following table:—

TABLE

Date	Red blood cells in 10^6 per c.mm.	Total	White blood cells: Differential count	Blood platelets per c.mm	Treatment
11-9-37	3.6	2,500 per c.mm.	Poly. .. 7.6 per cent; Lympho. 86 „; Mono. .. 3 „; Eosino. .. 6 „	..	
12-9-37	3.07	1,250	Poly. .. 4 per cent; Lympho. 92 „; Mono. .. 1 „; Eosino. .. 3 „	32,000	2 c.cm. hæmoplastin intramuscularly. 5 c.cm. 10 per cent calcium chloride intravenously. Manetol (Bayer) 1 tube 4 hourly. Nuclein 1 ampoule b.d.
13-9-37	..	1,300	Poly. .. 5 per cent; Lympho. 94 „; Eosino. .. 1 „	28,000	7 c.cm. calcium chloride intravenously. Manetol 1 ampoule 4 hourly. Nuclein 1 ampoule t.d.
14-9-37	1.95	1,200	Poly. .. 3 per cent; Lympho. 97 „	20,000	Manetol and nuclein continued. Stimulants, glucose and brandy. Coramine 2 c.cm. 4 hourly. Continuous oxygen.

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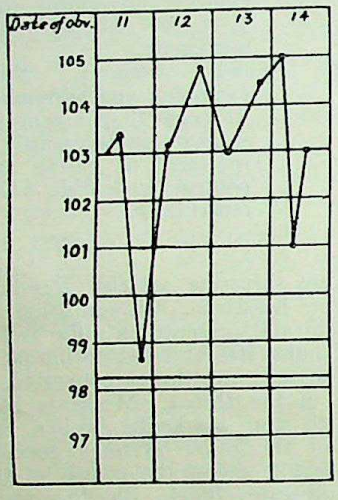
Other laboratory reports.—The blood smear showed anisocytosis, the blood culture and agglutination for *B. typhosus*, and para A, B and C were all negative.

The bleeding time was 2 minutes 30 seconds and the coagulation time 3 minutes 10 seconds.

Blood transfusion was not performed in this case either. A post-mortem examination was done and the following is an extract from the notes:—Sub-conjunctival hæmorrhage, sub-pericardial and sub-peritoneal petechiæ, sub-mucous hæmorrhages of the tongue and palate, and patches of ecchymosis on face and chest. Hæmorrhage into the left suprarenal glands. Entire stomach showed numerous sub-mucous patches of ecchymosis. The same was found in the intestine. Consolidation of the lower part of the upper lobe of the left lung—hypostatic pneumonia.

CHART 2

Name—*Kasinathan.*
Age—46.



Section of the cervical lymph glands.—The normal architecture of the node is lost. The cells are more or less uniformly distributed throughout the section. Marked proliferation of the lymphocytes, many of which show mitosis and active division. No myelocytes.

Section of femur.—Pale red marrow confined to the upper end; the rest showing atrophy and fatty transformation. Only very few cellular elements.

Section of lumbar vertebra (1st).—Very little pale red marrow is seen.

Bone-marrow smear (rib)
(Differential count)*

Erythroblasts	.. 1.1	per cent
Myelocytes	.. 1.1	„
Lymphocytes	.. 77	„
Plasma cells	.. 6.3	„
Eosinophils	.. 12	„
Basophils	.. 0.5	„
Undetermined cells	.. 2	„

Discussion

It is evident from the history of the above cases that their clinical conditions were due to the arsphenamine treatment employed. The recovery in case 1 confirms the observation of other workers, that usually thrombocytopœnic cases run a benign course and respond well to ordinary therapeutic measures. The platelet count in this case is much lower than that enumerated in any case so far. Though the patient was on his way to recovery it cannot be stated that complete regeneration of the platelets had occurred. When he was discharged the count was only 50,000 per c.mm. which is far below the normal. It is also to be noted that the symptoms in this case started two days after the last injection.

Case 2 is still more interesting in that it represents a typical secondary aplastic anæmia with all the blood elements employed. It is a moot point whether the severe type of aplastic anæmia caused in this case was the result of Fouadin or acetylarsan or a combination of both.

In case 3, neo-salvarsan was the drug employed. Agranulocytosis was the most prominent feature. Only the bone-marrow examination has thrown light on the aplastic condition of the hæmopoietic system. Possibly if he had survived some time more a better clinical picture of aplastic anæmia might have developed. In cases 2 and 3 there were no throat lesions which are usually associated with such low neutrophil counts. The tremendous amount of marrow damage is shown by the marrow count after death in case 3. The futile attempts at treatment are also shown by the two fatal cases. It cannot be said whether blood transfusion might have done any good.

Unfortunately we have no particular sign of warning for the early detection of this group of disorders. Attention may be drawn to a case only after doing a blood count. Undue bleeding from the gums during the arsenical treatment however offers us a clue in some cases. Moore and Kiedell advise a total and differential leucocytic count at frequent intervals during treatment. 'Leucopenia associated with a reduction of the percentage of the polymorphonuclear neutrophils and of large mononuclear transitional cells, or the appearance of many fragile or abnormal leucocytes, should be regarded as a serious omen' (Moore, 1933). It is perhaps also worth while to do a preliminary blood examination in debilitated patients and in the occasional group of cases where spreading and sloughing of the sore take place in spite of anti-syphilitic treatment.

The treatment of these secondary blood dyscrasias is far from being satisfactory, especially in the well-established cases of aplastic anæmia. The utter uselessness of the many therapeutic measures and the resulting high mortality of this severe type of blood disorder only show the helplessness of the clinician or the syphilologist when he is faced with such a condition. The earliest evidence of damage to the hæmopoietic system calls forth prompt withdrawal of further arsenic medication. Adrenaline is used in platelet deficiency; calcium, thiosulphate and liver preparations may be used as a

(*Continued at foot of opposite page*)

*The complete absence of normoblasts is very unusual: so also is the high lymphocyte count.—EDITOR, *I. M. G.*

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A SIMPLE METHOD OF OBTAINING HYPER-EXTENSION FOR THE APPLICATION OF A PLASTER OF PARIS JACKET IN CASES OF FRACTURE OF THE THORACIC AND LUMBAR VERTEBRÆ

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MAJOR, I.M.S.
Civil Surgeon, Nagpur, C. P.
and
INDUBHUSHAN BASU
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WHEN treating fractures of the thoracic or lumbar vertebræ by the Jones (1931) method we have always experienced some difficulty in applying the plaster jacket as the two tables get in the way to a certain extent. We have

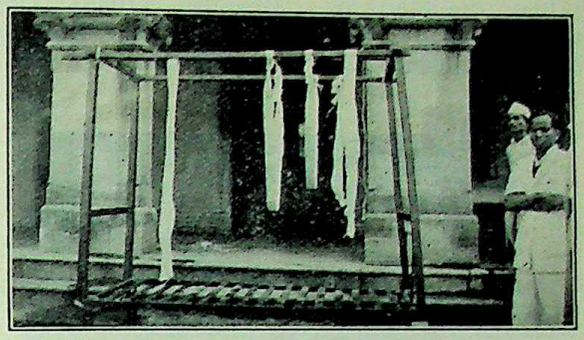

Fig. 1.—Showing the Balkan frame and the newar strips arranged for the reception of the patient.

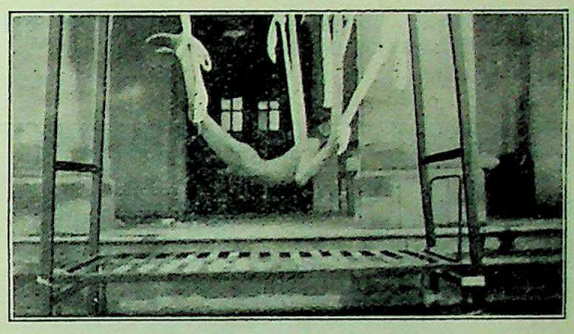

Fig. 2.—Showing the patient suspended. The hyper-extension is obtained by gradually drawing up the legs.

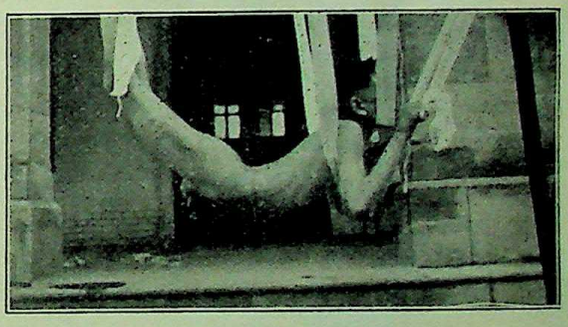

Fig. 3.—Showing how the head and arms are supported to keep them out of the way and allow of the application of shoulder braces. The newar supporting the chest is incorporated in the plaster.

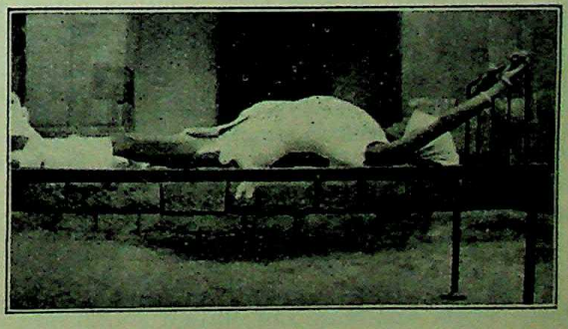

Fig. 4.—Showing the patient in an unpadded plaster jacket; arms extended.

(*Continued from previous page*)

routine. Bleeding may be stopped by symptomatic measures. Regeneration of the leucoblastic tissues is now attempted by using pentoseneucliotide and similar preparations. While some are of opinion that blood transfusion is the sheet-anchor in the treatment of aplastic anæmia, many unsuccessful reports have made it lose its value in others hands. Repeated blood transfusion may, however, tide over a crisis and give time for other measures to be adopted in the regeneration of the hæmopoietic system.

It is generally suggested that no further arsenical injections are to be given in the recovered cases. Recurrence is said to be invariably fatal.

Summary

1. A brief résumé of ' depressed bone-marrow function ' due to arsphenamines is attempted.
2. Some of the theories on the mechanism of production of this group of disorders are discussed.
3. Three cases are reported, two of them fatal, showing hypoplastic or even aplastic changes.
4. The interesting and special features of the cases are discussed.
5. A brief paragraph is devoted to the different lines of treatment adopted.
6. As in cases of post-arsenical encephalitis there is a large element of unpredictability and inevitability about this group of blood disorders.

We are indebted to Lieut.-Colonel G. R. McRobert, I.M.S., and Dr. D. Govinda Reddi for the notes of case 2, who was under their observation and treatment. Our thanks are due to the staff of the pathology department of the Medical College for the post-mortem notes on case 3.

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evolved the following simple method of using only strips of newar and a Balkan frame which appears to us to be simpler for most Indian hospitals, especially the smaller ones, than the method depicted by Boehler (1935). The photographs are, we consider, sufficient to illustrate the method.

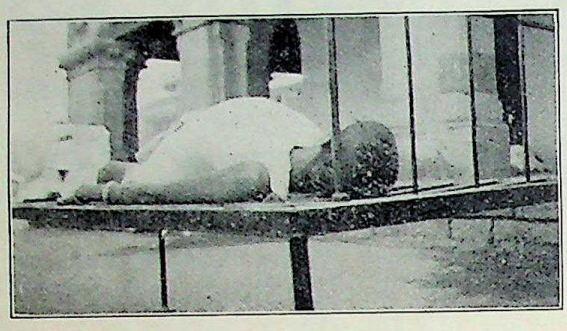

Fig. 5.—Showing the patient with arms flexed and illustrating the shoulder braces.

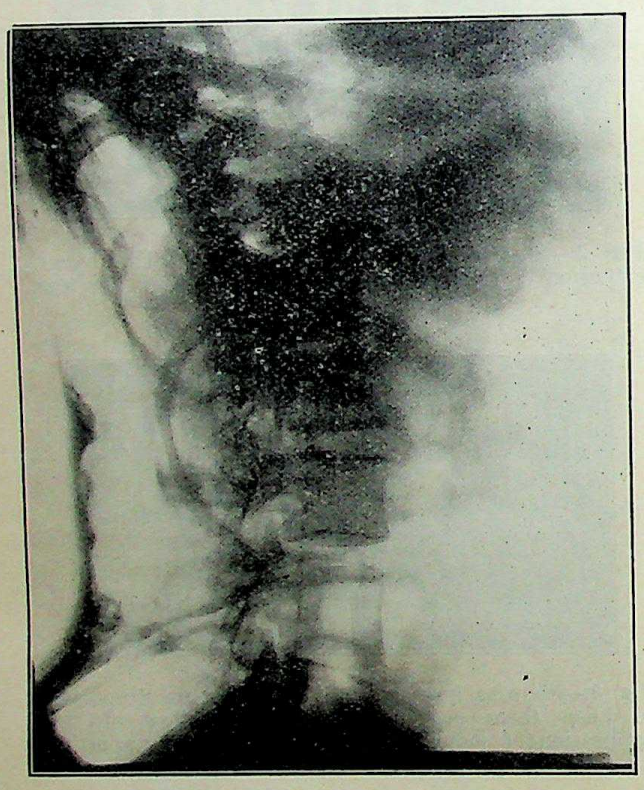

Fig. 6.—Skiagram showing good reduction obtained by this method in a fracture of the first lumbar vertebra.

Warning. This method will not obviate operative interference if there is a dislocation of the lumbar vertebræ such that the lower articular processes of one vertebra are wedged in front of the upper articular processes of the vertebra next below. It is therefore imperative to take a lateral skiagram.

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PREMEDICATION IN SODIUM EVIPAN ANÆSTHESIA—A STUDY OF 535 CASES

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A REPORT on thirty patients operated upon under sodium evipan anæsthesia by the present writer (1934) appeared in this journal. In none of these cases was any premedication used, because it was held at that time by the manufacturers to be contra-indicated. Since then, the writer has had the opportunity of observing the effects of sodium evipan in over 500 cases, and an attempt is made in this article to assess the comparative values of sodium evipan with and without premedication. While indicating its great usefulness in minor operations, and in a lesser degree in major operations, a record was made in the last article of three complete failures, in spite of maximum dosage, out of a total of thirty cases. It was also recorded that 10 patients had to be given either morphia or eukodal injections after the operation because they became very boisterous. Further experience of 45 more cases confirmed the reality of these two defects. In an attempt mainly to overcome these difficulties as suggested in an article by Nichol (1935) we started premedication with eukodal (Merck), a codeine derivative, and hyoscine hydrobromide. Nichol himself and others had used omnopon, a morphia derivative, in the place of eukodal. The 535 cases under review include 350 patients operated upon without premedication and 185 with premedication. After the first 75 cases, which were all done without premedication, the cases selected for premedication were generally those major and minor operations where a fair relaxation and certainty of effect were important. Moreover, those patients were also selected who, on account of their heavy build or for other reasons, were likely to be more resistant to evipan. These 185 cases therefore are a good test of the effect of sodium evipan.

Technique and dosage.—About one hour before the operation, a patient of average build and health is given ¼ gr. of eukodal and 1/150 gr. of hyoscine subcutaneously, and the patient left in a quiet dark place. The patient is drowsy or asleep when he is taken to the theatre, and the injection started in a convenient vein. Each gramme of the white powder is dissolved in 10 c.cm. of sterile distilled water supplied with it. The patient is asked to count slowly, as the injection is given at the speed of 1 c.cm. for 15 to 20 seconds. Most patients stop counting after 2 or 3 c.cm. have been injected, and become unconscious. If the patient holds the breath, or if the breathing is slow or shallow after the first few c.cm. as often happens, it should cause no alarm, but further pushing in of the solution is delayed till the

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breathing is better and is then continued. This respiratory phenomenon is less marked after correct premedication than without any. The dosage is judged by the weight, age and general health of the patient, by the relaxation of the jaw, and also to some extent by the time he takes to stop counting during injection. When the patient has become insensitive to pin-pricks, no more solution need be injected. If tremors of the limbs occur or the patient becomes stiff when the knife is used, it means that the dose has been just below optimum. The average dose needed is about 8 c.cm. Strong, sturdy, and heavy adults often need the full dose of 10 c.cm., while feeble old people, diabetics and those debilitated by disease may go under with 4 or 5 c.cm. only. Alcoholics and neurotic patients require a higher dosage than the average. The same technique is adopted when no premedication is used, but the dose required to get the patient under is always higher and the effect not always certain either, as will be shown later.

Precautions.—Successful results with sodium evipan depend in a great degree on proper dosage and timing of premedication. The dose of hyoscine is kept fixed at 1/150 gr. while the dose of eukodal is varied from 1/6 gr. to 1/3 gr. according to the weight of the individual, $\frac{1}{4}$ gr. being the average. Only very heavy individuals, prepared for an operation needing fair relaxation, require the maximum of 1/3 gr. The operation should never be started earlier than 45 minutes after premedication. With these precautions there is little risk of respiratory depression. Even though in a few cases the breathing may be somewhat slow or shallow after the injection of evipan, as soon as the operation is started it corrects itself. In such cases, the blood may be rather dark when the first incision is made, but turns brighter quickly as the breathing becomes deeper. Among the 535 cases under review not one patient has died of respiratory failure or of any other cause attributable to sodium evipan. There have been a very few cases where the respiration stopped for a few seconds, but they were easily revived by an injection of icoral or coramine and by artificial respiration. The head should be turned to one side during the injection of evipan to prevent the tongue falling backwards.

Advantages of premedication.—The most important advantage is that it greatly diminishes the risk of failure to get the patient satisfactorily under, as the following figures will show.

'Complete success' denotes good relaxation at the start of operation. Under 'satisfactory' are included those cases, where, though full relaxation was not obtained after injection and the patient might have reacted to the first skin incision, the operation could be carried on without delay or inconvenience, sometimes with a few whiffs of an inhalation anæsthetic.

'Failures' are those cases which, even after the full dose of 10 c.cm., moved and struggled so that the operation could be proceeded with only after the patient was got under a chloroform-ether mixture. Thus, the percentage of failure with premedication is only 3.8 per cent as against 15 per cent without premedication. The seven failures with premedication were encountered with very heavy robust adults, with alcoholics, or with highly neurotic patients.

	Total	Complete success	Satisfactory	Failures	Percentage of failure
Number of cases with premedication.	185	140	38	7	3.8
Number of cases without premedication.	350	232	66	52	15.0

The other important advantage is that while fully 30 per cent of cases without premedication become boisterous after operation, the number of such cases is negligible when premedication is used. The tendency to post-operative restlessness is greater when an operation is started with the patient not fully under. Post-operative vomiting is rarely met with in evipan anæsthesia.

In addition to these two advantages of premedication, the respiration is more even during the injection of evipan, the disturbing muscular twitches and jerks are avoided, and the available duration of anæsthesia is increased by a few minutes. The anæsthesia can easily be continued with a few whiffs of chloroform-ether mixture or pure ether if the patient shows signs of coming out before the operation is over.

Suitability of evipan for different operations.—Its greatest sphere of usefulness lies in minor surgery. For opening of abscesses, removal of small superficial tumours, dilatation and curetting of the uterus, repair of injuries, hydrocele, etc., it is extremely convenient and safe to use. In addition, it can be used with advantage in selected major operations like exploratory laparotomy, appendicectomy ectopic gestation, etc., lasting not more than half an hour. In these cases the sodium evipan can be supplemented if necessary when its effect is wearing out by a mixture of chloroform-ether. For patients acutely ill, evipan is safer to use than any other general anæsthetic. Diabetes, nephritis and diseases of the lung are indications rather than contra-indications for the use of evipan.

For major operations of long duration involving much shock, evipan is not indicated. For

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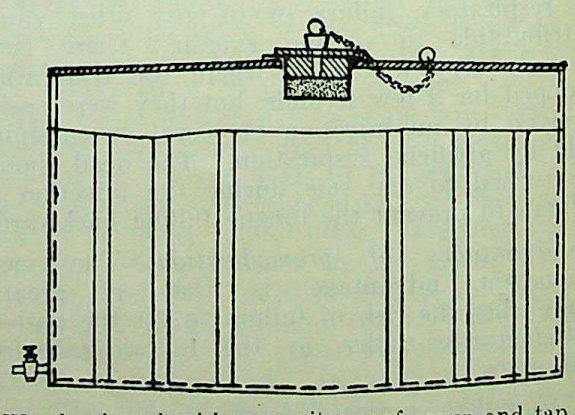
CONTROL OF *STEGOMYIA FASCIATA* (*ÆDES ÆGYPTI*) MOSQUITOES IN INDIAN COUNTRY CRAFT BY A MOSQUITO-PROOF METAL CAP (BENNETT PATTERN) FOR DRINKING-WATER RECEPTACLES

By F. D. BANA, M.B., M.R.C.S., D.P.H., D.T.M. & H., J.P.
Administrative Medical Officer, Bombay Port Trust

FOLLOWING on Colonel Covell's and Dr. Mhatre's recommendations in their malaria and ædes surveys of Bombay, 1928 and 1933, to lessen the breeding of *Stegomyia fasciata* mosquito in the country craft in the docks and bunders of Bombay, measures have been taken by the Bombay Port Trust from time to time to minimize this nuisance. This article attempts to relate the measures taken, with a brief description and a sketch of a mosquito-proof cap devised and fitted to drinking-water barrels and receptacles in the country craft, with which it is hoped to reduce the incidence of breeding of this potential carrier of yellow fever in the Port of Bombay. The danger of the spread of this disease to India is increased by the speeding up of modern travel, and especially by aerial transport bringing its endemic centres in Africa nearer to India. Once the virus of yellow fever is introduced the disease may be spread like wild-fire by the stegomyia prevailing in Bombay. In the words of the Sanitary Commissioner with the Government of India: 'Should yellow fever happen to be introduced into India, the disease would be so appalling that it might well cripple the country for a generation, as all factors which make for a rapid spread of the disease are present'.

Native craft trading in or with Bombay come from the western coast line of India including Sindh, Kathiawar, Gujarat, Bassein in the north to Ratnagiri, Goa and Cochin in the south. The stegomyia mosquito is found breeding in these country craft, mostly in the wooden drinking-water barrels or boxes, or other open water receptacles. A preliminary survey made in 1935 has revealed that out of 898 country craft examined, during the stated period, fully 458 or 51 per cent or every alternate craft was found harbouring the mosquito or its development form in various stages (Bana, 1936). It was therefore decided to take steps to minimize this breeding by selecting a special gang of workmen from the malaria preventive staff of Bombay Port Trust called 'the country-craft gang', to examine regularly from the shore side as many of these country craft as possible and to empty out infested water, giving a free supply of water in replacement. This has been carried out for the last three years by firm persuasion and educating the owners as to the danger of mosquito breeding, and the co-operation of the master, *tindal* or crew of the craft has been obtained. These were at first hostile, but later co-operated in minimizing the nuisance and danger to themselves and others working in the Docks. Thus, during the year 1935-36 about



Wooden barrel with mosquito-proof cover and tap. Scale 3/4 inch to a foot.

19,453 country craft were examined in the Alexandra, Prince's, and Victoria Docks and in Malet, Carnac, Sassoon and Darukhana bunders, of which 5,688 were found breeding and 5,551 were emptied out. The percentage of breeding

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(*Continued from previous page*)

such, avertin, whose action is almost specific in preventing shock, is to be preferred.

In three cases of Cæsarean section for which we used sodium evipan, we found the babies asphyxiated and revived them with some trouble. We are definitely of the opinion that it should not be used for Cæsarean section.

Sodium evipan is also not convenient for tonsillectomy and operations generally on the throat and nose, because sneezing and cough may be troublesome. Moreover, the vascularity of the parts is increased and there is more hæmorrhage than usual. It is unsuitable for operations about the anus and rectum, such as hæmorrhoids and fistulæ in ano, because the dilatation of the anal sphincter causes much shock. A low spinal analgesia with the patient in a sitting position gives unrivalled relaxation of the sphincter for these cases.

Summary and conclusion.—Premedication should be carried out as a routine before sodium evipan. Exceptions are operations of a very minor nature like the opening of an abscess, and also patients who are extremely ill, when premedication is not necessary. The advantages of premedication are explained and the dosage and technique of administration of sodium evipan described in detail. Its suitability for various operations is also discussed.

For kind permission to publish this report I am grateful to Lieut.-Colonel R. F. D. MacGregor, I.M.S., Chief Medical Officer of the K. E. M. Hospital, Secunderabad, where this study was made.

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by this voluntary working was reduced to 28.7 per cent from 51 per cent. As the Port Trust had no legal powers to enforce this inspection the Government of Bombay were approached and they were pleased to give powers under the Indian Ports Act to legalize their action, in December 1936. The results of the working for 1936-37 are still better, inasmuch as the ratio of those found breeding to those examined was brought down to 19.3 per cent, the actual numbers of country craft examined being 22,789 of which 4,338 were found breeding and 4,335 emptied out and given free supply (3 only defaulting before the powers were given). This happy result of voluntary inspection, later backed by powers obtained, shows what co-operation and education can do in matters of sanitation and habits of the people, most of whom are ignorant and hardly able to read or write. The dual control of the mosquitoes in the native craft in the Port of Bombay with the regular land campaign on the Port Trust Estates has lessened the incidence of this pest and it is gratifying to note that there are less complaints from staff, shipping, general public and other services. During the monsoon, however, extra sources of breeding have to be contended with, *i.e.*, open areas, roof gutters, etc., for which extra men and material are required.

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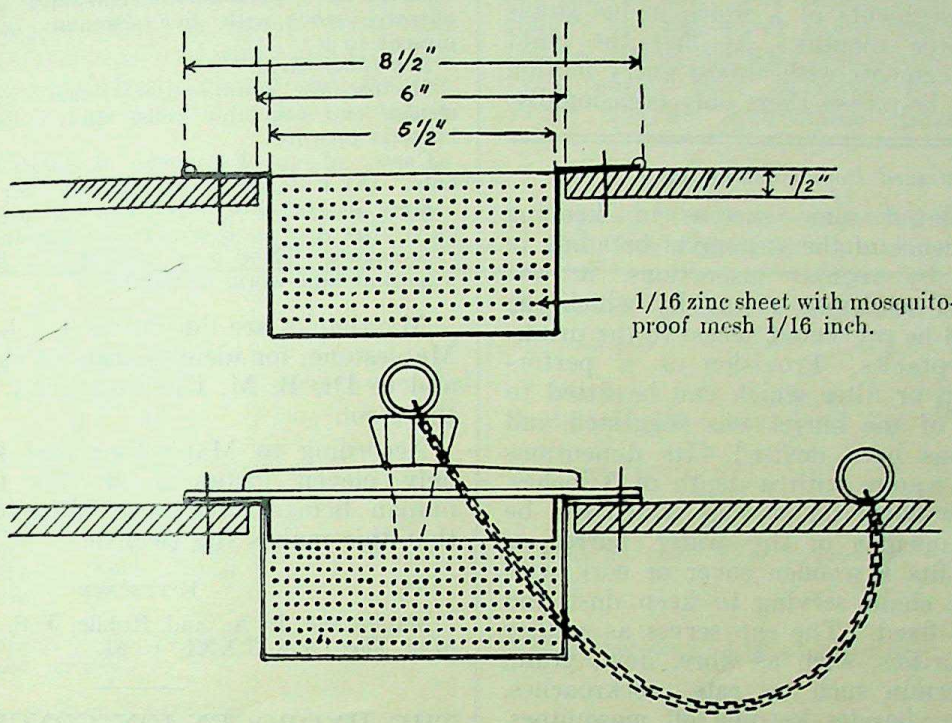
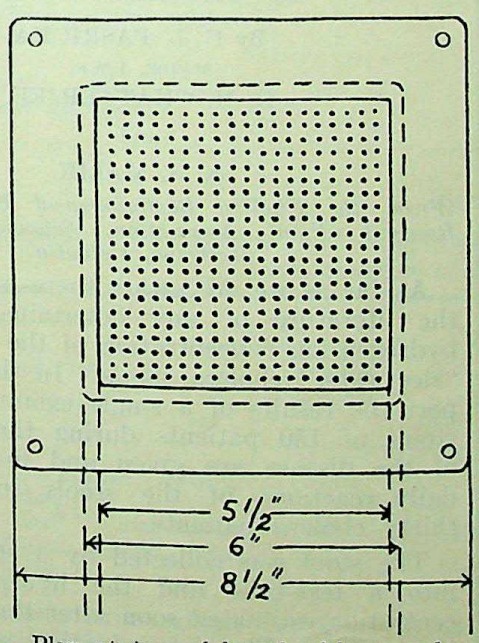
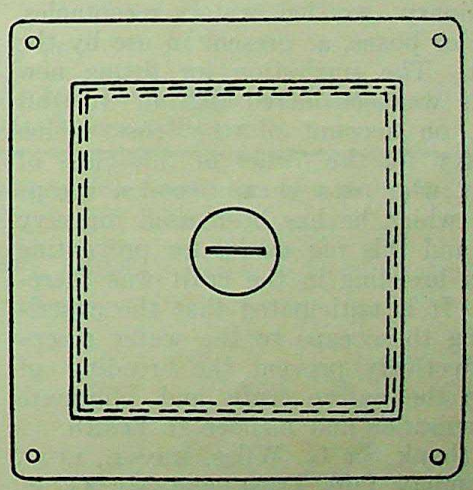


Mosquito-proof cap with plug.



Plan at top of barrel without cork.



Plan at top of cork.

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BERTIELLA STUDERI, A NATURAL TAPE-WORM PARASITE OF MONKEYS, IN A HINDU CHILD

By SUDHIR CHANDRA ROY, B.SC., M.B., D.T.M.
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THE patient, a Hindu Brahmin male child, aged eight years, fairly well nourished, has been passing segments of a worm in his stools for the last ten months. At first the child passed these segments with almost every motion but at present he passes them only occasionally.

The only complaint is occasional griping round the umbilicus. The tongue is slightly coated and liver just palpable. The child had an attack of dysentery about one year back.

The child lives in Barisal but came here only three months ago.

Stool examination reports

Naked-eye appearance.—Semi-solid, greyish, slightly offensive stool with live segments of a tape-worm present in it.

Reaction.—Acid.

Microscopic examination.—Some undigested food residue and vegetable cells, and a fair number of bacteria present.

Cysts of—(*a*) *Entamœba histolytica* present—few only. (*b*) *Entamœba coli* present—fair number.

Eggs of—(*a*) *Trichuris trichiura* present—very few only. (*b*) *Ascaris lumbricoides* present—numerous.

Segments.—These were identified as *Bertiella studeri*, a natural tape-worm of monkeys.

My thanks are due to my teachers, Dr. P. A. Maplestone, for identification of this tape-worm, and to Dr. B. M. Das Gupta for the report on the stool.

According to Maplestone and Riddle (1936) only eleven instances of this tape-worm in human beings have been hitherto reported so that this makes the twelfth.

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(*Continued from previous page*)

Having achieved some success in keeping down the incidence of the stegomyia breeding in country craft by regular inspections, it was further decided to devise a way by which the mosquito could be prevented access to the drinking-water receptacles. Provision of a perforated metal cap or filter which can be fitted to the man-hole of the barrel was suggested and such a cap has been devised. Its dimensions are 5½ inches square with a depth of 3 inches. It has a screw-down lid or edge which can be fitted to the opening of the water barrel or box. Into it fits a wooden cover or cork with a handle and chain serving to keep dust and dirt out when fixed. The cap serves as a filter to gross impurities, such as fibre, dust, grain, seeds, and vermin such as rats, cockroaches, ants, flies, etc., besides keeping off mosquitoes. It has a perforated mesh of holes 1/16 inch in size. The water of a barrel fitted with one shows not only no mosquito larvæ, but is clearer and cleaner, containing less debris. The barrel has to be fitted with a draw-off tap at the bottom. This cap can be made in sizes and fitted to ordinary wooden water receptacles, either barrels or boxes, at present in use by the country craft. The suggestion for fitting new metal cisterns was considered difficult to put into practice, on account of the cost which would be heavy for the owner of this class of country boats who uses cheap wooden receptacles and to which he has been used for very many years, and this *via media* for preventing the stegomyia breeding in the craft was therefore devised. It is anticipated that the experiment of fitting these caps to the water receptacles will effectively prevent the breeding of mosquitoes in the native craft and eliminate the existing nuisance and menace to health.

I have to thank Sir G. Wiles, K.C.S.I., I.C.S., chairman, Bombay Port Trust, and Mr. G. E. Bennett, chief engineer and acting chairman, for rendering all help, and the latter for designing the cap, after whom it is named.

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THE HYDROGEN-ION CONCENTRATION OF CHOLERA STOOLS

By C. L. PASRICHA
MAJOR, I.M.S.
D. N. CHATTERJEE,
and
K. S. MALIK
(*From the Cholera Bacteriological Enquiry, Indian Research Fund Association, School of Tropical Medicine, Calcutta*)

As far as we are aware there is no record in the literature of any determinations of the hydrogen-ion concentration of the characteristic 'rice-water' cholera stools. In the present report the results of a single examination of the stools of 150 patients during the acute stage of the disease are given and in addition the daily reactions of the stools in a series of thirty cholera patients.

The stool was collected by a sterile catheter into a test-tube and the hydrogen-ion concentration estimated soon after the collection of the sample. The determination was completed within 30 minutes of the collection. A Hellige comparator with a non-fading standard colour disc and 13 mm. rectangular troughs was used for the estimation of the pH values. The indicators employed were methyl red (pH 4.4 to 6.0), brom-thymol blue (pH 6.0 to 7.6), phenol red (pH 6.8 to 8.4) and thymol blue (pH 8.0 to 9.6). The samples examined were

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liquid and of such a consistency that it was not necessary to dilute the stools. A few samples which were turbid were centrifuged and the supernatant fluid used for the estimation. The pH value of 12 typical rice-water cholera stools was determined both by the quinhydron electrode and the Hellige's comparator. The readings obtained by the colorimetric method approximated closely with those taken by the electrical method. The deviation with the colorimetric method was uniformly towards the acid side and varied from those taken by the electric method by about 0.2. This deviation was most marked when brom-thymol blue was used as an indicator and not with the other indicators. The results recorded are those obtained by the colorimetric method.

Approximately 65 per cent of the typical rice-water stools without visible fæcal matter were distinctly alkaline in reaction. The majority of the alkaline stools were within the range of pH 7.5 to 8.5. The reaction of about 35 per cent of the rice-water stools was below pH 7.0, but not below pH 6.0. Fluid stools with visible fæcal matter were distinctly on the acid side. There was no appreciable difference in the

TABLE I

The reaction of stools collected during the acute stage of the disease (within 2 days of the onset of symptoms) from a series of 150 clinically cholera patients

Type of stool	Number of samples examined	Percentage of samples giving different reactions		
		Acid (below pH 7.0)	Alkaline (above pH 7.0)	Neutral or within the limits pH 6.9 to 7.1
(A) *Agglutinable vibrios isolated from the stool.*				
(1) Typical 'rice-water' without visible fæcal matter.	98	36 or 37 per cent	62 or 63 per cent	13 or 13 per cent
(2) Liquid with visible fæcal matter.	17	13 or 76 per cent	4 or 24 per cent	Nil.
(B) *Agglutinable vibrios not isolated from the stool.*				
(1) Typical 'rice-water' without visible fæcal matter.	28	9 or 32 per cent	19 or 68 per cent	2 or 7 per cent
(2) Liquid with visible fæcal matter.	7	5 or 71 per cent	2 or 29 per cent	Nil.

TABLE II

The hydrogen-ion concentration of the stools collected during the acute stage of the disease from a series of 150 cholera patients

Type of stool	Number of samples examined	Percentage of samples showing different pH values					
		6.0–6.5	6.6–7.0	7.1–7.5	7.6–8.0	8.1–8.5	8.6–9.0
(A) *Agglutinable vibrios isolated from the stool.*							
(1) Typical 'rice-water' without visible fæcal matter.	98	11	26	6	26	28	3
(2) Liquid with visible fæcal matter.	17	35	41	0	12	12	..
(B) *Agglutinable vibrios not isolated from the stool.*							
(1) Typical 'rice-water' without visible fæcal matter.	28	14	18	3	22	36	7
(2) Liquid with visible fæcal matter.	7	58	13	0	29	..	..

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reaction of rice-water stools when tinged with blood or bile. This will be apparent from table III in which are shown the reactions of stools collected on different days of the disease in a series of 30 bacteriologically-proven cholera cases.

TABLE III

Showing the character, the hydrogen-ion concentration and the result of examination for vibrios of samples of cholera stools collected on different days of the disease

Case number	Day of disease						
	2nd	3rd	4th	5th	6th	7th	8th
468	..	R.W. 8.6 V+	F. 6.8 V+	F. 8.5 V+	F. 8.6 V−	F. 7.9 V−	..
477	..	R.W. 8.6 V+	R.W. 8.6 V+	..	..	..	..
478	R.W. 8.3 V+	R.W.B. 8.3 V+	F. 7.2 V+	..	..	..	..
485	..	R.W. 8.1 V+	R.W. 8.1 V+	F. 8.1 V+	F. 7.5 V+	..	..
489	..	R.W. 7.6 V+	R.W. 8.1 V+	..	..	..	..
525	R.W. 8.2 V+	R.W.B. 8.4 V+	R.W.B. 7.5 V+	R.W.B. 7.5 V+	F. 7.5 V+	F. 6.6 V+	F. 6.2 V+
536	R.W. 7.7 V+	R.W. 6.5 V+	R.W.B. 8.3 V+	R.W.B. 8.6 V+	F. 7.6 V−	F. 6.4 V−	..
538	R.W. 8.1 V+	F. 7.0 V+	F. 6.7 V+	F. 6.5 V+	..	..	..
540	R.W.Bd. 7.7 V+	R.W.Bd. 7.5 V+	R.W.B. 6.7 V+	F. 6.0 V+	F. 6.0 V−	..	..
541	..	R.W. 6.7 V+	R.W. 6.9 V+	F. 6.6 V+	F. 6.3 V+	..	..
542	R.W. 7.5 V+	R.W.B. 6.9 V+	F. 6.2 V+	F. 6.0 V+	F. 6.3 V+	..	..
564	R.W. 7.5 V+	R.W.B. 7.5 V+	R.W.B. 7.6 V+	F. 7.1 V+	..	..	..
569	R.W. 8.3 V+	R.W. 8.1 V+	R.W. 6.8 V+	..	..	..	..
570	R.W. 8.5 V+	R.W. 7.0 V+	F. 6.9 V+	..	..	..	..
573	R.W. 8.3 V+	R.W.B. 7.9 V+	F. 6.6 V−	..	..	..	..
597	R.W. 7.6 V+	F. 6.0 V−	..	..	..	..	..
618	R.W. 7.8 V+	R.W. 8.6 V+	R.W.B. 8.3 V+	F. 7.1 V+	..	..	..
619	R.W. 6.8 V−	R.W. 6.9 V+	..	..	..	..	..
620	R.W. 7.2 V+	R.W.B. 6.5 V−	R.W.B. 7.2 V+	F. 6.4 V+	..	..	..
641	R.W.Bd. 7.5 V+	R.W.B. 7.4 V+	F. 6.8 V−	..	..	..	..
644	R.W.B. 6.9 V+	R.W.B. 6.9 V−	R.W.B. 6.9 V+	..	..	..	..

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TABLE III—*concld.*

Case number	Day of disease						
	2nd	3rd	4th	5th	6th	7th	8th
649	..	R.W.Bd. 8.3 V+	F. 6.9 V+	..	..	..	..
650	R.W. 8.1 V+	F. 6.3 V+	..	..	..	..	..
651	R.W.Bd. 7.9 V—	F. 6.1 V+	..	..	..	..	..
766	R.W.B. 7.7 V+	F. 6.7 V—	F. 7.7 V+	..	..	..	..
768	R.W. 7.9 V+	R.W.Bd. 7.9 V+	F. 6.9 V+	F. 6.9 V+	..	..	..
770	R.W.B. 6.9 V—	F. 6.7 V+	F. 6.4 V+	..	..	..	..
771	F. 6.5 V—	F. 7.7 V+	F. 7.7 V+	..	..	..	..
776	R.W. 6.7 V+	R.W. 8.1 V+	F. 6 5 V+	F. 6.3 V—	..	..	..
779	R.W.Bd. 8.3 V—	R.W.Bd. 7.7 V+	R.W.Bd. 7.7 V+	F. 6.9 V+	..	..	..

Character of stool.

R.W. = Typical rice-water stool.
R.W.Bd. = Rice-water stool tinged with blood.
R.W.B. = Rice-water stool containing bile.
F. = Liquid stool containing visible fæcal matter.

The bacteriological findings.

V+ = *Vibrio choleræ* (agglutinable to full titre with standard 'O' serum) isolated from the specimen.
V— = No vibrio isolated from the specimen.

In this series 105 samples of cholera stools collected on different days of the disease were examined. The isolation of vibrios from stools of different reactions is shown in table IV.

TABLE IV

Showing the pH of the stool and the isolation of V. choleræ *from stools of different reactions*

The reaction of the stool	Number of samples examined	Number and percentage from which vibrios were recovered	Number and percentage from which vibrios were not recovered
pH 6.0 to 7.0 ..	44	32 or 73 per cent	12 or 27 per cent
pH 7.1 to 8.0 ..	35	32 or 91 per cent	3 or 9 per cent
pH 8.1 to 9.0 ..	26	24 or 92 per cent	2 or 8 per cent

It will be seen that the percentage of successful isolations of *V. choleræ* was higher in alkaline stools than in acid stools. The relative frequency of alkaline and acid stools on different days of the disease is shown in table V.

TABLE V

The relative frequency of acid and alkaline stools on different days of the disease

Day of disease	Number of samples examined	Percentages of samples of stools of different reactions		
		pH 6.0 to 7.0	pH 7.1 to 8.0	pH 8.1 to 9.0
2nd ..	24	21	46	33
3rd ..	30	43	27	30
4th ..	26	54	27	19
5th ..	14	58	21	21
6th, 7th and 8th.	11	55	36	9

The relative frequency of acid stools increases as the patient gets better. The frequency of isolation of vibrios from stools of different reactions on the second to the fifth days of the

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disease are shown in table VI. The number of samples examined on the sixth, seventh and eighth days were too few to be included in the table.

TABLE VI

The frequency of isolation of vibrios from acid and alkaline stools on different days of the disease

Day of disease	Number of samples examined	Number of samples of stools of different reactions and the percentage from which vibrios were isolated					
		pH 6.0 to 7.0		pH 7.1 to 8.0		pH 8.1 to 9.0	
		Number	Per cent positive	Number	Per cent positive	Number	Per cent positive
2nd	24	5	40	11	91	8	88
3rd	30	13	69	8	100	9	100
4th	26	14	86	7	100	5	100
5th	14	8	88	3	100	3	100

V. choleræ were isolated from nearly all the alkaline stools. Vibrios were isolated from 40 per cent of the acid stools examined on the second day of the disease and with increasing frequency in the acid stools passed during the next three days. On the fourth and fifth days vibrios were found in 86 and 88 per cent of the samples of acid stools. This suggests that there occurs in the intestines considerable multiplication of vibrios by the third or fourth day as a result of which vibrios can be found in increasing frequency in acid stools.

Summary

1. The hydrogen-ion concentration of samples of stools of 150 cholera patients collected during the first two days after onset of symptoms was determined by the colorimetric method.

2. Approximately 65 per cent of typical rice-water stools without visible fæcal matter were alkaline. The majority of these samples had a pH value between 7.5 to 8.5. About 35 per cent of the stools were acid (pH below 7.0 but not below 6.0). Stools containing fæcal matter were distinctly acid in reaction.

3. In a series of 30 cholera patients whose stools were examined daily, vibrios were found in nearly all the alkaline samples and in a much smaller proportion of the samples whose reactions were on the acid side.

4. An analysis was made of the frequency of the stools of varying reactions of different days of the disease and the frequency with which vibrios can be isolated from stools of different reactions.

A Mirror of Hospital Practice

AN UNUSUAL CASE OF ABORTION TREATED BY CURETTING

By D. R. LEWIS, M.B., F.R.C.S. (Edin.)
Civil Surgeon, Maubin

A BURMESE woman, aged 39, was brought to the civil hospital, Maubin, at 8 p.m. on the 17th March, 1938, with the history that she had had vague pains in the lower abdomen for the past 6 weeks and that there was slight loss of blood *per vaginam* during all this period. She was said to be in the fifth month of her eleventh pregnancy. It was further reported that at about noon on the day of admission she noticed some substance drop from her vagina which she found to be a hand of a fœtus.

On arrival at the hospital the patient had a temperature of 101°F. and her pulse was 130 per minute. The os was dilated, just enough to admit one finger. There was no bleeding and the uterus was soft. She was given an enema and it was decided to let her rest for the night and to operate on her the next day. Accordingly she was given a full dose of mistura hypnotica and she slept well that night.

The next morning she was put under chloroform and the uterus was evacuated of its contents by means of a blunt curette. The fœtus had undergone decomposition and was found lying in the uterus soaked in purulent fluid. It came out piecemeal. There was smart bleeding from the uterus during the process of evacuation of its contents. The placenta was firmly adherent to the uterine wall and had to be scraped out. Bleeding did not stop until 2½ c.cm. of pituitrin and 10 c.cm. of normal horse serum had been given intramuscularly. Despite the loss of blood the patient's pulse continued to be steady and bounding. After evacuation the cavity of the uterus was douched with hot water to which had been added lotio acriflavine and liquor adrenalin hydrochloride. The uterus was thereafter packed with gauze soaked in lotio acriflavine 1 in 1,000 and the vagina was packed with iodoform gauze. A 'T' bandage was applied and the patient put to bed. An injection of 5 c.cm. of a 5 per cent solution of prontosil 'Bayer' was given intramuscularly. Two hours after the operation the patient had a rigor and her temperature shot up to 103°F. She slept well that night and the next morning her temperature was normal. The gauze plug inserted into the uterus was removed and there was no offensive discharge.

The patient was up and about on the 4th day after the operation and demanded permission to return home.

This is a remarkable recovery. The fœtus had undergone decomposition in the uterine cavity and there was pus in it at the time of curetting.

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SIMPLE FRACTURES AND DISLOCATIONS OF THE ASTRAGALUS

By M. G. KINI, M.C., M.B., M.Ch. (Orth.), F.R.C.S.E.
Surgeon, King George Hospital, Vizagapatam (S. India)
and
P. KESAVASWAMI
Radiologist

SIMPLE fractures and dislocations of the astragalus are not common and when they occur they are the result of serious injuries such as falls from a height on the foot. Various types of dislocation and fractures have been reported. The problem of treating these conditions is difficult when the cases are seen at the time of injury and becomes greater when seen long after, without proper treatment. The following two cases illustrate the two different types of injuries of the astragalus.

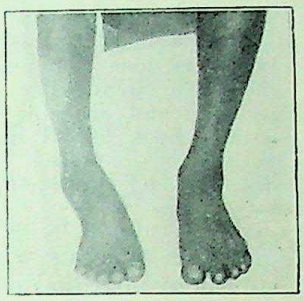
No. 1. *Case illustrating a simple forward and lateral dislocation of the talus in the right ankle joint.*

A male, aged 35 years, was admitted in 1935 for treatment of pain in the right ankle of 8 months' duration. He had fallen from a tree on his foot and was unconscious after the fall for one day. He was treated in his village without proper medical aid.

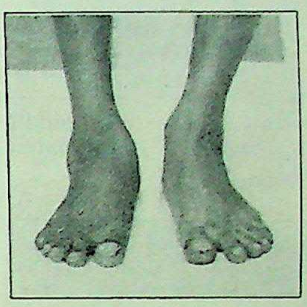
On admission the patient walked with difficulty and pain, with his right foot inverted and adducted. On examination the ankle joint was found broader and there was a marked prominence on the antero-lateral aspect of the joint. The muscles of the right leg were markedly wasted. On palpation the head of the talus was palpable on the antero-lateral aspect in front of the external malleolus. Movements of dorsi-flexion and plantar-flexion were limited. Inversion and eversion of foot were painful. *X*-ray showed a forward and lateral dislocation of the astragalus without any injury to the malleoli. He was operated on under spinal anæsthesia and astragalectomy of Whitman's type was done.

He made an uneventful recovery. He was able to walk three months after operation and can now walk six miles without fatigue.

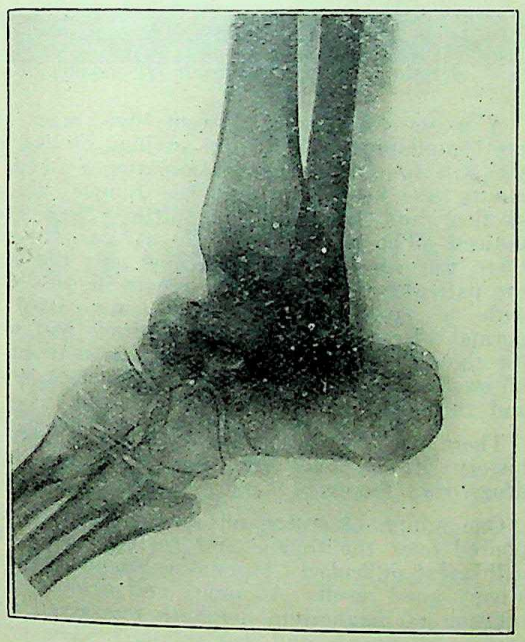
Case 1



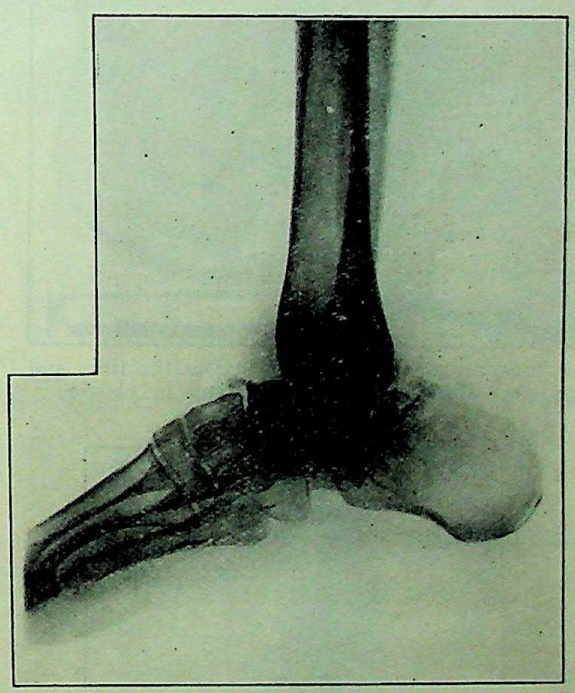
The ankle before operation.



The ankle after operation.



Showing forward and lateral dislocation.



Position of lower end of tibia and fibula after Whitman's astragalectomy.

No. 2. *Case illustrating a simple fracture of talus with forward and upward displacement of anterior fragment in the right ankle joint.*

A male, aged 31 years, was admitted early in 1936 for the treatment of pain in the right foot of 4 months' duration. The accident occurred

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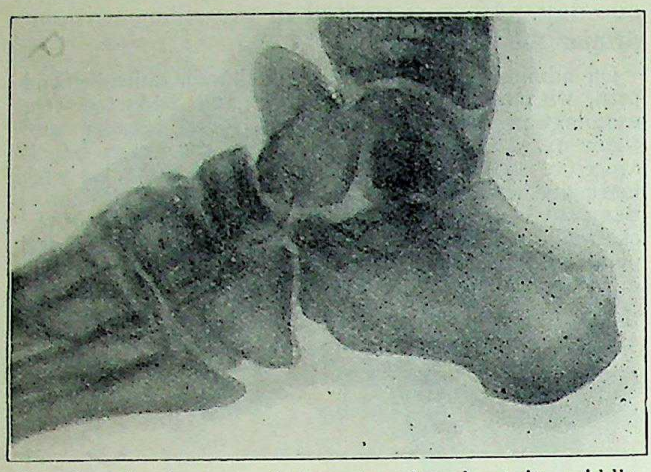
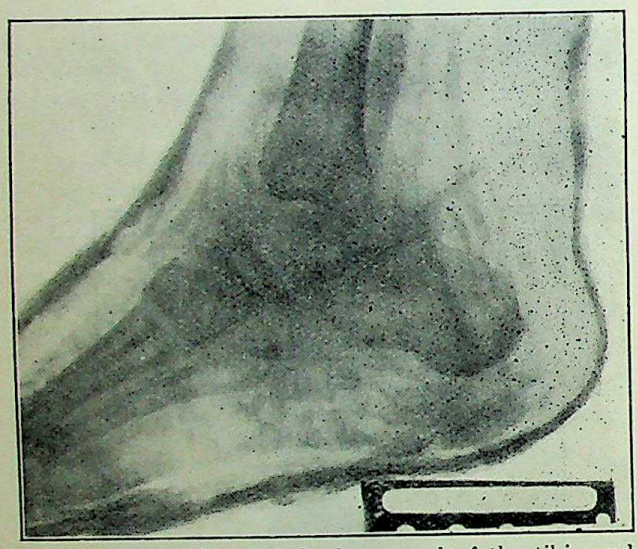
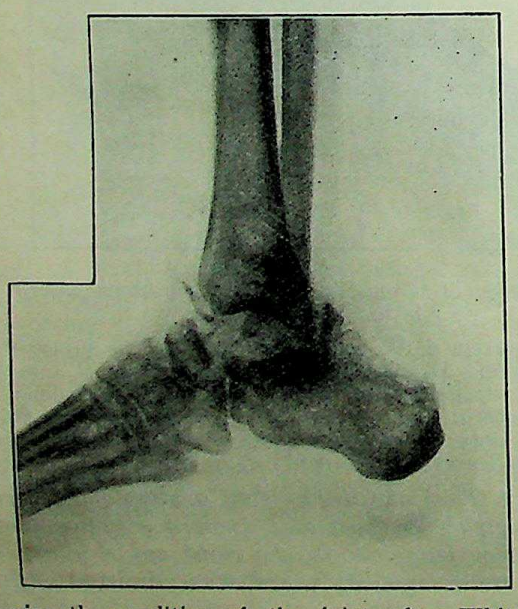
Case 2



Showing the fracture of the astragalus about its middle with forward and upward displacement of the anterior fragment.



Showing the position of the lower end of the tibia and fibula after Whitman's astragalectomy in plaster.



Showing the condition of the joint after Whitman's astragalectomy before discharge.

while he was getting down from a train which was just coming to a stop. He slipped and twisted his right foot which caused him severe pain. The ankle joint swelled rapidly for which first aid was given. Subsequently the limb was put in plaster after *x*-ray examination.

On admission he walked with a marked limp. There was marked fullness in front of the ankle joint. There was a globular swelling of the size of a small walnut on the antero-medial aspect of the joint in front of and below the medial malleolus. This swelling felt bony hard on palpation. Movements of ankle were very markedly limited. On *x*-ray examination, the astragalus was found fractured in the middle with the anterior fragment tilted forwards and upwards. There was no injury to the malleoli. The ankle joint showed osteo-arthritic changes.

Under spinal anæsthesia, astragalectomy of Whitman's type was done removing all the osteoid tissue inside the ankle joint. The patient made an uneventful recovery and was able to walk in ten weeks' time with a boot, lateral iron and inside T strap. The patient has reported that he is able to walk long distances and is able to attend to his duties.

The problem of old fractures and dislocations of the astragalus when they come late is best solved by astragalectomy of Whitman's type as these two cases illustrate.

A LINGUAL ABSCESS

By C. L. DAMANIA, M.B., B.S.

Assistant Surgeon, Vadali Dispensary, Vadali

A WOMAN, aged about twenty-five, came to consult me complaining of a painful swelling of the tongue for the past four days. On examination I found that the mouth was kept open and the tongue was markedly swollen and protruding a little. No redness was noticed. The back of the throat was not visible, as there was considerable tenderness over the tongue and the patient would not allow me to depress the tongue with a spatula. Temperature was 100.5°F. Pulse normal. Respirations normal. Bowels had not moved for the last three days. There was marked difficulty of swallowing even of liquids. The neck was swollen and the lymphatic glands were palpable.

There was no history of urticaria. There was no history of an insect bite, nor of having taken any drugs, *e.g.*, mercury.

One minim of croton oil in a drachm of water was poured over the tongue and the patient swallowed it with great difficulty. Turpentine enema was given with a very good result. An ounce and a half of saturated solution of magnesium sulphate was given slowly per rectum afterwards and was retained. The tongue was painted with 5 per cent cocaine in adrenalin. An injection of 10 c.cm. polyvalent antistreptococcic serum (P. D. & Co.) was given intramuscularly. The patient refused to allow incision of the tongue and would not remain at the dispensary. Cocain, 5 per cent in adrenalin, was prescribed for application, every two hours. Hot fomentations to the neck and mouth were advised.

Patient had six watery stools during that night; at about 12 p.m. the swelling burst underneath the tongue and about an ounce and a half of pus escaped. When I saw her next morning, I noticed that the swelling had gone down considerably and there was less pain. Hydrogen peroxide and potassium permanganate gargles were ordered alternately and the patient felt completely relieved of her complaint by the evening.

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Indian Medical Gazette

JUNE

CINCHONA SUPPLIES IN INDIA

WE have many times in the past referred to the cinchona problem in this country, but it is such an important one that we feel no apology is needed for raising it again. In a land where a huge percentage of the population is crippled by malaria and where there are large tracts of country climatically suited to the cultivation of the cinchona plant, self-sufficiency in the matter of the supply of the cinchona alkaloids is surely a legitimate ideal.

It is so obvious an ideal that it has repeatedly been the avowed policy of the Government of India during the last three-quarters of a century, since the cinchona plant was first cultivated in India. We deliberately choose the word 'repeatedly' because it has not been their *continuous* policy and that is where much of the trouble lies. Had the government pursued a consistent policy from the beginning the present position would never have arisen, but working against a slight climatic handicap they failed either to keep pace with the Dutch planters in Java or to provide the necessary protection to the private concerns which were attempting to grow cinchona on a commercial scale, so that India soon fell out of the world market, and Java acquired a complete monopoly. The idea of self-sufficiency from an Empire standpoint was raised during the war and was in 1918 adopted as the government policy, but the efforts to develop this policy were only half-hearted and at the first excuse it was abandoned or at least modified to self-sufficiency for India; even this modified policy has never been pursued with any vigour, and attainment is still nowhere in sight.

Recently, the subject has been seized upon as suitable for the political platform; the Kina Bureau—the Amsterdam syndicate who control the quinine market—are made the chief villains of the piece and the Government of India the chief dupes; the latter are accused of depriving India of any chance of developing her own quinine cultivation by the 'terrible agreement' with Java. This agreement is, in our opinion, not a very favourable one to the interests of malaria control in India, but it is a very natural one from the Java point of view—the Dutch demand that if they sell us quinine at a price below the market one it shall not be resold again at a competitive price. This unfortunately, but inevitably, also involves in the price restriction the quinine produced in this country. The local governments who grow quinine, Bengal in particular, are further accused of making a handsome profit out of the cultivation, manufacture, and sale of quinine, and of maintaining a price which is beyond the pockets of the poor fever-stricken ryot. This all sounds very terrible when thundered out in the Assembly or on the political platform, but the solution of the problem is not as simple as one would gather from the critics. In the first place the cinchona planter in Java has to live: he could, we believe, reduce the price of quinine by half, if he could sell three times as much as he is selling to-day, but if the Kina Bureau were to allow the price to fall and the consumption did not rise correspondingly, a number of plantations in Java would go out of commission, supplies would fail, and the price would go higher than ever. The cinchona alkaloids are an essential commodity to malarious countries and so that the Kina Bureau, whilst protecting the Java planters, is also indirectly serving the interests of all malarious countries.

Nevertheless, whatever *forward* policy the government adopts, it is necessary to make some immediate provision for India's hundred million annual malaria-sick, and, as India's quinine output is in the neighbourhood of 70,000 pounds, and her potential requirements at least 1,000,000 pounds, the margin has to be purchased from Java, who are in the position to say 'these are our terms; take it or leave it'; in actual practice India's consumption has never risen above 200,000 pounds per annum which means that four out of every five malaria sufferers receive no treatment, or that a greater proportion receive inadequate treatment.

The position of the Government of Bengal, a cinchona producing province, is also quite understandable, and though we seldom find ourselves in the position of defending our natural enemy, the finance department, we do not, on this occasion, picture them, as do the politicians, in the rôle of Shylock squeezing an extortionate profit from the ague-stricken peasant. They find that they can produce quinine at about Rs. 6-8 when the market value is Rs. 22 a pound. If they made a generous gesture and said 'we will take a reasonable margin to cover overhead charges and interest on capital expenditure (not taken into consideration in the above figure) and sell our quinine at Rs. 10', the Government of Bengal would lose their profit, but who would gain? Certainly not the ryot, and the gesture would have no effect on the world price of quinine. On the other hand it is reasonable to ask that the whole of this profit—or balance of quinine after production cost have been paid, whichever way one cares to look at it—should be available for the malaria-sick of Bengal, either through dispensaries or other means of distribution, or alternatively that the profit should be devoted to extending their present cinchona plantations, which have now passed their prime and have reached the stage of producing a yearly-diminishing output of bark.

In the last number of the *Records of the Malaria Survey of India*, there is an article on quinine supplies in India, by Colonel A. J. H.

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Russell, the Public Health Commissioner with the Government of India, which is an explanation, or an apologia as the critics of this government would probably prefer to call it, of the policy of the Government of India.

This paper is a very valuable exposition of the problem and it has clarified many points on which there was obviously considerable misconception, but it gives no indication of the government's future policy and the only conclusion at which the writer arrives is as to the extreme complexity of the problem. We are a little disappointed that he did not develop more the question of the substitution of totaquina, or of some standardized cinchona febrifuge, for quinine. His references to this subject include the following sentences 'In the opinion of many experts, cinchona febrifuge and totaquina are almost as effective as quinine for mass treatment purposes; moreover, they can usually be produced at a lower cost' and 'apart from the changes in the relative costs, however, it seems that at present the drug of choice for mass treatment in India is an improved cinchona febrifuge . . . '. But there is very much more to be said on this subject.

We have always taken the view, and it is one that we still hold, that, if the various governments in India would make up their minds to provide totaquina, or some other cinchona febrifuge, for their hospitals and dispensaries, on a very much more generous scale than they do now, and to restrict the use of quinine to special cases, a very big step towards the solution of India's cinchona problem would have been made.

Colonel Russell raises an old bogey, namely, that if cinchona febrifuge became very popular, the price might rise to the present price of quinine. This is a red herring that is repeatedly drawn across the trail by those interested in quinine manufacture. One does not imagine for one instant that our policy would appeal to Java; as we have suggested above, and Colonel Russell supports this view, at a word from Amsterdam the production of quinine in Java could be trebled, and the price lowered, and so why should they be interested in an article whose only virtue is that it can be produced more abundantly and cheaply. Moreover, they have for years studied the cultivation of cinchona from the point of view of the special alkaloid, quinine, and it is on the fact that the climate of Java is so suited to the growth of this high-quinine-yielding bark that the quinine monopoly of Java depends.

The position in India is quite different. There is no restriction of output; on the contrary all the available bark is used for the extraction of the alkaloids. If only quinine is extracted the alkaloidal output will obviously be much less than if the whole of the utilizable alkaloids are extracted; and if the various alkaloids are not separated and refined, certain processes in the manufacture will be simplified, therefore not only will there be more total alkaloids available for use but the cost of production per pound must necessarily be considerably less. We cannot conceive of any conditions, except a purely artificial and temporary one brought about by interested parties, in which the price of the total alkaloids could rise to the price of the single alkaloid quinine, though it is possible that the price of quinine might be forced down by the popularity of the total alkaloids.

But this is not by any means all there is to be said in favour of the substitution of the total alkaloids for quinine in malaria therapy. The areas in India which are suitable for the cultivation of the high-quinine-yielding species of cinchona, *viz, Cinchona ledgeriana,* are limited and it is doubtful if sufficient acreage could be found to grow bark for our total requirements, but there are other more hardy species, *Cinchona succirubra,* and the hybrids, *C. officinalis* and *C. robusta,* which produce a lower percentage of quinine—though enough to fulfil the requirements for the manufacture of totaquina—and a high percentage of the other alkaloids, and which, growing well under much less climatically favourable conditions, could be cultivated over wide areas in India. If this were done India could be made independent of outside supplies of cinchona alkaloids.

One might criticize those responsible for the government plantations and cinchona factories and say why have they not already adopted this policy: their reply is a simple one—'the demand is still for quinine and not for the total alkaloids and we must shape our policy to meet this demand'. So that before they criticize the government cinchona planters and manufacturers, or the local governments, or the Government of India, or finally the Kina Bureau, let our readers first consider if they are themselves altogether blameless. Do they prescribe cinchona febrifuge or quinine? Do they indent for cinchona febrifuge or for quinine for their hospitals or dispensaries? Do they teach their students that in the vast majority of cases cinchona febrifuge by mouth is the treatment of choice in malaria?

We do not mean to imply that the Government of India are blameless. Far from it: their lack of foresight in the past allowed India to drift into this difficult position, and in the more recent past their policy has been half-hearted and vacillating. However, we cannot now be extricated by a stroke of the pen or the terminating of an agreement. The cinchona tree grows slowly; it is about 8 years before any yield may be expected and a much longer period before this yield reaches its maximum. We believe that at present an expert, commissioned by the Government of India, is touring the country to see what are the possibilities of extending cinchona plantations. If this means that the Government of India is reviving and is proposing to pursue more actively what is

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still, we believe, their avowed policy, namely, self-sufficiency for India in her cinchona supplies, the news will be very welcome; and we hope that in reshaping this policy they will view the problem in all its aspects. We believe that the substitution throughout India of a standardized cinchona febrifuge for quinine in hospitals, in dispensaries, and in all public-health anti-malarial schemes offers the best means of escape from the present impasse. Whatever policy they do adopt, we hope it will be a permanent one, and not the kind that attracts the attention of the first economy expert that comes along.

Special Article

THE ERGOT PROBLEM AND THE PRACTITIONER

By B. MUKERJI, M.D., D.SC. (Mich.)

(From the Biochemical Standardization Laboratory, Government of India. All-India Institute of Hygiene and Public Health, Calcutta)

Historical and general

ERGOT is the compact mycelium of the fungus *Claviceps purpurea* which develops in the ovary of the rye (*Secale cornutum*, N. O. *Graminæ*). Its action on the human uterus came to be recognized nearly four centuries ago through widespread epidemics of disease called 'ergotism' which resulted from eating bread made of rye infected with the fungus. Frequent abortions occurred in women sufferers during these outbreaks and this naturally attracted pointed attention to the possible rôle which this fungus might play in bringing about uterine stimulation. The earliest authentic reference to the medicinal use of ergot was made by Adam Lonicer (Clark, 1927) who stated that ergot powder was very efficient in bringing on labour pains. In the seventeenth century, ergot was used extensively for the purpose of criminal abortion and in consequence its use was forbidden by many authorities. It was however reintroduced in the eighteenth century, and gradually found a recognized application in obstetrical practice. Its entry into British official medicine dates from a brief reference by Parmentier (Barger, 1931) and more particularly from a detailed paper by Desgranges, an obstetrician of Lyons in France. Papers on the properties of ergot by Stearns (Barger, 1931) and by Prescot (Barger, 1931) of America were also responsible for giving an impetus to its adoption in the *British Pharmacopœia*. It is interesting to note that though many other medicinal herbs and drugs of various kinds were used all over the world for their oxytocic properties in labour and the puerperium, most of them are lost to-day, with the exception of ergot which is still serving mankind. Indeed, it is the oxytocic *par excellence*, as it is the only effective drug which can be given by the mouth. Even midwives can use it with impunity to stop fatal post-partum hæmorrhage in outlying places where medical aid is either not available or not easily forthcoming.

A perusal of the old literature on ergot shows that physicians possessed a remarkably clear conception of the chief action of the drug and also the best way to secure such action clinically, long before the complex chemical constitution of ergot was worked out and its active principles isolated. A quotation from Buchheim (Clark, 1927) will indicate the state of knowledge about ergot therapy about the middle of the nineteenth century. 'Ergot is used very frequently to stimulate the contractions of the uterus when there is prolonged weakness of the pains. Violent and prolonged pains usually commence ten to twenty minutes after administration of the drug and delivery soon follows. This can only happen in safety when there is no mechanical obstruction due to such causes as contracted pelvis, abnormal position, etc., and when the cervix is fully dilated, although the pains are not strong enough to produce delivery. In other conditions, the violent contractions can easily produce injury to the uterus....Ergot from very wet places is inactive. Preparations lose activity on keeping and no method of producing a stable preparation has been discovered. It is best to give the drug as powder 10 to 20 grammes every 15 to 20 minutes, until the desired action occurs'. These remarks made nearly 80 years ago appear to be true without much alteration even to this day, when considerable advances have been made in our knowledge about ergot.

Owing to the importance of ergot in obstetrics, many chemical and pharmacological studies have been made of the various active constituents isolated from it from time to time. In spite of such studies, the clinical use of ergot has not been entirely satisfactory up to the present time, and obstetricians have observed a marked variability in the potency of different preparations of this drug. During recent years, a considerable amount of interest has been focused on the ergot problem through the discovery of a new active principle which is probably responsible for most of the oxytocic activity of ergot. This discovery is likely to have a very important bearing on the therapeutic application of the drug. As the subject is of vital interest to practitioners, an attempt has been made in this article to review the present status of the ergot problem with special reference to the suitability or otherwise in practical therapeutics, of the pharmaceutical preparations of ergot available in the Indian market.

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Chemistry of ergot

Let us first see what are the chemical constituents of ergot and what are the active principles in the drug, for which it is so much prized in medicine. Ergot may be said to be a veritable storehouse of chemical substances, as will be seen from the following table (modified from Barger, 1937).

TABLE I

Constituents of ergot

(A) *Amines*

(1) Isoamylamine
(2) Tyramine
(3) Histamine
(4) Cadaverine
(5) Agmatine
(6) Guanidobutylamine

Decarboxylation products of: Leucine, Tyrosine, Histidine, Lysine, Arginine

(C) *Other simple bases*

Choline
Acetylcholine
Ergothioneine
Uracil
Guanosine

Decomposition product of: Lecithin of rye ovary; Thiolhistidine

(D) *Sterols*

Ergosterol
Fungisterol

(E) *Inert extractives*

(1) Fixed oil (10 to 35 per cent).
(2) Colouring principle (sclererythrin).
(3) Inorganic salts.
(4) Complex proteinogenous substances.

(B) *Alkaloids*

Pairs	Group I: Lævo-rotatory and pharmacologically active — Name and empirical formula	Optical rotation [α] 546.1	Group II: Dextro-rotatory and almost inert — Name	Optical rotation [α] 546.1
I	Ergotoxin (Barger and Carr, 1906). $C_{35}H_{39}O_5N_5$	− 226°	Ergotinine (Tanret, 1875)	+ 466°
			Ergotinine (Smith and Timmis, 1931).	+ 513°
II	Ergocristin (Stoll and Burckhardt, 1937). $C_{35}H_{39}O_5N_5$	− 183°	Ergocristinin (Stoll and Burckhardt, 1937).	+ 366°
III	Ergotamine (Stoll, 1920) $C_{33}H_{35}O_5N_5$	− 181°	Ergotaminine (Stoll, 1920)	+ 450°
IV	Ergosine (Smith and Timmis, 1936). $C_{30}H_{37}O_5N_5$	− 193°	Ergosinine (Smith and Timmis, 1936).	+ 522°
V	Ergometrine (Dudley and Moir, 1935). $C_{19}H_{23}O_2N_3$	− 16°	Ergometrinine (Smith and Timmis, 1936).	+ 596°

Ergoclavine ($[\alpha]\frac{22}{D} + 124°$) is probably a molecular compound of an alkaloid resembling ergotoxine and one resembling ergotinine. (Küssner.)

Sensibamine (Stoll) is probably a similar but much less stable molecular compound of ergotamine and ergotaminine.

1. *Amines present in ergot*

Amongst the substances referred to in table I, the two chief groups of substances which have been considered responsible for the characteristic action of ergot are (1) the amines and (2) the alkaloids. Though the amines are almost always found associated with ergot preparations, they are not specific for the drug and are seldom found in freshly collected specimens—a fact which is not sometimes sufficiently well stressed. These amines are really produced, as a result of putrefaction, in extracts of both animal and plant origin. Histamine and tyramine are the most important amines of the group and it has been shown fairly conclusively that both of them are effective only when injected subcutaneously, intramuscularly or intravenously but are destroyed either in the gastro-intestinal tract or in the liver when introduced through the oral route. Even when administered hypodermically, histamine produces only a very transitory effect upon the uterus of experimental animals, and it is believed that the doses required as a parturient would be so large as

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to be dangerous on account of the depressant effect of histamine on blood pressure. As ergot preparations are definitely proved to be active by the oral route, it is clear that this activity does not lie in its amine content. The amines, therefore, cannot be the clinically-useful constituents of ergot, and their action on the uterus in *in vitro* experiments may be taken altogether out of therapeutic consideration.

2. *Alkaloids present in ergot*

It is now generally agreed that ergot, like many other substances of natural origin, owes its characteristic effects to the presence of the alkaloids. A number of these alkaloids had been isolated from it at wide intervals over a period of 60 years, but the exact relationships of these alkaloids to each other and to the activity of the drug as a whole were not clearly understood. The rapid and remarkable advances in our knowledge of ergot alkaloids within recent years through the researches of Jacobs and Craig (1932–36) in America, Smith and Timmis (1930–37) in England, and Stoll and Burckhardt (1935, 1937) in Switzerland have however clarified the problem a good deal. It is now possible to state that ergot contains five pairs of inter-convertible isomerides which differ from each other in chemical composition and physical properties. All the five pairs of isomeric alkaloids are particularly well characterized and their molecular formulæ have been established and confirmed by hydrolysis. The alkaloids with their molecular formulæ and years of discovery are described in table I. Each pair consists of a lævo-rotatory alkaloid having a powerful pharmacological action and a strongly dextro-rotatory one with but little pharmacological activity. The inert alkaloids are sparingly soluble in organic solvents and crystallize readily without the solvent of crystallization. The potent alkaloids, on the other hand, have a remarkable power of forming 'additive' compounds with the solvent and with the isomeric inert alkaloids. Ergoclavine and sensibamine (*see* bottom of table I) have been shown to be such crystalline molecular compounds. The chemical constitution of the various pairs has also been successfully investigated and it has been established that they are all derivatives of *lysergic acid*. This finding has thrown some light on the physical behaviour, solubility, deterioration, etc., of the ergot alkaloids. It is not necessary for our purposes here to go into the details regarding the chemical constitution and properties of each member of the series. The alkaloids shown in the left-hand column of table I are the pharmacologically potent ones, and therefore we may confine our remarks to these active principles only. For purposes of description, these may be conveniently classified into two groups:—

(1) *The ergotoxine group.*—The first four pairs of alkaloids may be included in this group. Ergotoxine is the most abundant and the best known representative of this group and one of the first active principles isolated in pure form. It is an amorphous alkaloid, very sparingly soluble in water and is easily precipitated from colloidal solutions by electrolytes, notably salts and mineral acids. It is however soluble in some of the organic solvents like alcohol, benzene, carbon bisulphide, etc. Ergotamine, the next best known constituent, was isolated as a crystalline base by Stoll in 1920 and described by Spiro and Stoll in 1921. In its solubility and other physical properties it resembles ergotoxine very closely, though its salts (tartrate and methanesulphonate) are generally rather more soluble than those of ergotoxine. Ergoclavine, as has been pointed out, is not an independent alkaloid, but is considered to be a compound of ergosine and ergosinine and sensibamine, a similar mixture of ergotamine and ergotaminine. This chemical relationship indicates that both these alkaloids will behave like ergotoxine in their biological reactions on the system. These may therefore be included in the ergotoxine group of alkaloids.

(2) *The ergometrine group.*—In 1932, Moir working with watery extracts of ergot reached the conclusion from clinical investigation that 'the characteristic and traditional effect of ergot was caused not by ergotoxine, ergotamine, tyramine or histamine, but by a substance still unidentified'. Dudley in 1935 isolated and identified the substance in question and named it 'ergometrine'. Ergometrine, as will be seen from the table, is comparatively simpler in structure to the previously known ergot alkaloids. It is soluble in water to some extent as a free base but gives salts which are freely soluble in water and easily absorbed from the alimentary canal. Following closely upon Dudley's work, the discovery of a water-soluble alkaloid was reported from three different laboratories, two in the United States of America and one in the continent of Europe. These were named ergostetrine (Thompson, 1935), ergotocin (Kharasch and Legault, 1935) and ergobasin (Stoll and Burckhardt, 1935). On account of some discrepancies in the physical properties, at first it seemed that four different alkaloids had been discovered. But certain definite similarities, both in their physico-chemical and biological behaviour, led to the belief that all of these new substances might be different names of the same alkaloid. After an exchange of specimens, it has now been decided that all the four alkaloids are identical (Kharasch, King, Stoll and Thompson, 1936). Strictly speaking, therefore, the ergometrine group contains a single alkaloid which has been named differently by different workers. The Council of Pharmacy and Chemistry of the American Medical Association have decided to call the new alkaloid 'ergonovin' to ensure uniformity in nomenclature and to avoid the difficulties regarding the priority of claim of discoverers. As the *British Pharmacopœia* has

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retained the original name of 'ergometrine', it will be advantageous for our readers to refer it as 'ergometrine' throughout this article.

Pharmacology of ergot

Until 1930, it was generally assumed that all the desirable activity of ergot in obstetrics was primarily due to ergotoxine. With the discovery of ergotamine, it was shown that this alkaloid was also a potent oxytocic. These two alkaloids therefore are not only very similar chemically, but pharmacodynamically also they are generally identical. Dale and Spiro (1922) stated that qualitatively they were equal, and quantitative differences were so slight that, for all practical purposes, the two substances may be said to be the same, with the exception that ergotoxine is probably slightly more toxic (Lozinski, Holden and Diver, 1933). Ergosine has not been studied in detail pharmacologically and ergocristin has only been very recently discovered. From the meagre data that are available, it seems that these two alkaloids may be very similar to ergotoxine in their pharmacodynamic reactions.

Reports regarding the pharmacological action of ergometrine have already appeared from several sources (Rothlin, 1935; Davis, Adair, Chen and Swanson, 1935; Brown and Dale, 1935; Ghosh and others, 1936). It will be of interest to compare the pharmacological syndromes produced by the two chief alkaloids, in order to understand the full significance of their behaviour on the human uterus. Table II shows the important pharmacological characteristics of ergotoxine and ergometrine. It will be seen that along with differences in the chemical composition, solubility and melting points, ergometrine exhibits significant pharmacological peculiarities. Ergotoxine produces a typical gangrene of the cock's comb, rise of blood pressure, depression or paralysis of isolated rabbit uterus and a reversal of adrenaline effect—all pointing to a paralytic effect on the motor sympathetics. Ergometrine, on the other hand, does not exhibit any of these peculiarities even in higher doses. Rothlin (*loc. cit.*) showed that a 10 to 20 times stronger dose of ergometrine had no adrenaline reversal effect on blood pressure and a 100 to 200 times stronger dose caused no adrenaline inhibitory effect on the isolated rabbit uterus. The action on the uterus of ergometrine is particularly worthy of note. Ergometrine brings about a long persistent rhythm of powerful contractions with gradual increase in the tonicity of the uterus. A typical tetany of the corpus uteri may be seen sometimes in experiments on human parturient uterus, lasting for one to two hours without complete relaxation at any time. This type of contraction simulates closely the contractions ordinarily initiated during the puerperium. Ergometrine produces hardly any rise in blood pressure and there are no unpleasant side effects even with three to four times the clinical dosage. On account of its low molecular weight, ergometrine is more easily absorbed and is almost twice as potent as the larger molecule of ergotamine or ergotoxine. By the oral route, ergometrine action starts within 5 to 8 minutes. Ergotoxine, on the other hand, is characterized by delayed absorption and the typical uterine action never

TABLE II

Ergotoxine vs. *Ergometrine*

Name of drug	Absorption and toxicity	Blood vessels	Uterus	Other effects	Seat of action
Ergotoxine ..	Delayed absorption by mouth. More toxic than ergometrine.	Strong constriction: B. P. markedly raised. Cyanosis of cock's comb and gangrene.	Isolated rabbit uterus depressed or paralysed. Virgin, parous or puerperal uterus of other mammals—contraction; tone predominating over rhythm. Action delayed.	Inhibitory action on adrenaline present, blood sugar—no effect: pupils—constriction.	Central excitation with general sympathetic stimulation. Motor sympathetics inhibited and paralysed (1 : 10,000,000).
Ergometrine ..	Fairly rapid absorption by mouth. Less toxic than ergotoxine.	B. P. varies according to anæsthesia. Pithed cat—slight rise. Anæsthetized cat—fall. Cyanosis—present. No gangrene of comb.	Isolated rabbit uterus — stimulated in very dilute solutions (1 : 2,000,000). Long persistent rhythm of powerful contractions and increase in tone as in early puerperium. Action quick.	Inhibitory action on adrenaline—nil. Dilatation of the pupil, constriction of blood vessels, relaxation of intestinal movements. Blood sugar raised.	Specific paralysing action on motor sympathetics—almost nil. (1 : 500,000).

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appears before 40 to 60 minutes, and even then the effects are sometimes rather erratic. The uterine response also is of a different type; an increase in the tonicity of uterine musculature is more often marked than an increase in the rhythmic contractions. Ergotoxine action, however, persists for several hours, much longer than that of ergometrine.

Medicinal preparations of ergot

From all the experimental evidence available, it becomes readily apparent that any ergot preparation in order to be of use clinically must contain significant amounts of the specific alkaloids. The amines, though always identified with ergot preparations, are redundant constituents, and may actually interfere with the action of the alkaloids (Thompson, 1930). It has been estimated that clinical activity is obtained when the total alkaloids of ergot are present to the extent of 0.05 to 0.1 per cent calculated as ergotoxine ethanesulphonate or ergotamine tartrate. Since the two members of the various pairs of alkaloids (referred to in table I) are readily transformed into each other, it is a matter of doubt to what extent each occurs as such or arises during the process of separation. The ratio of inactive to active alkaloids varies from 1.4 to 2.2, but it may well be lower. The amount of ergometrine in Spanish ergot is considered by Smith and Timmis (1931) to be 10 to 15 per cent of the total but assays by Hampshire and Page indicate a somewhat higher proportion (about 20 per cent). From the clinical viewpoint, ergometrine ought to prove of greater therapeutic utility than ergotoxine. It has been claimed that this new alkaloid is responsible for 75 to 85 per cent of the oxytocic action of ergot on the human uterus. It is important, therefore, that any extract of ergot must contain this principle, if it is to justify its inclusion in the therapeutic armamentarium. Though ergometrine may be considered more important during recent years, ergotoxine cannot be left altogether out of consideration. It is probable that ergometrine initiates the uterine contraction which is carried on for a longer period by ergotoxine, so that both of them are of value and probably give a combined action. In the preparation of liquid preparations of ergot, it is necessary to see that the final extract contains at least the minimum amount of specific alkaloids of both the ergotoxine and ergometrine group. These requirements can be fulfilled only by a proper selection of methods of extraction and preparation and by employing a method of either chemical or biological standardization which will accurately estimate the alkaloidal content and physiological activity of the preparations. Let us now see how far these specifications are fulfilled in the commercial ergot preparations, so commonly used by practitioners.

In table III is given a number of preparations of ergot which are commonly met with on the market in India. Apart from the numerous proprietary and patent preparations of British and foreign manufacturers which are used in special emergencies by individual practitioners, the preparations that are most commonly prescribed are the liquid preparations of ergot mentioned in the *British Pharmacopœia* of both 1914 and 1932. According to the *British Pharmacopœia* 1914 'extract ergot liq.' is made with distilled water, 90 per cent alcohol being added subsequently to give a concentration of 30 per cent in the final product (ergot content—1 gm. per 1 c.c.). From the physical and chemical properties of the ergotoxine group of alkaloids, it will be clear that the occurrence of these alkaloids in any considerable proportion in these preparations is not likely. Ergometrine being slightly soluble in water and moderately soluble

TABLE III

Commercial ergot preparations

Liquid preparations	Solid preparations
Official:—	Official:—
Ext. ergot liq. (*B. P.* 1914)	Ergota preparata (*B. P.* 1932)
Tr. ergot ammon. (*B. P. C.*)	Ergotoxine ethanesulphonas (*B. P.* 1932)
Ext. ergot liq. (*B. P.* 1932)	Ergotoxine phosphate (*B. P. C.*)
Fluid extract ergot (*U. S. P.* XI)	Ergometrine hydrochloride (*Addendum*, 1936)
Ext. of ergot N. F. (U. S. A.)	
Non-official:—	Non-official:—
Liq. ergot fort (B. C. P. W.)	Ext. ergotæ (semi-solid extract)
Liq. ergot purif. (Hewlett)	Ergotinine (Fr. Codex) (Ergotinine crystalisée)
Ergole (Oppenheimer)	Erbolin capsules (Glaxo Lab., London)
Ergodex (B. D. H.)	Ergotamine tartrate (Gynergen, Sandoz: Basle, Swit.)
Ergotin (Ergotina Bonjeau)	Sensibamine (Chinoin A. G. Budapest)
Ernutin (B. W. & Co.)	Ergoclavine (Küssner, Berlin)
Ergothane ampoules (Evans Sons)	Ergotrate tablets, hydracrylate of ergonovin (ergometrine) (Lilly)
Ergot aseptic ampoules (P. D. & Co.)	
Ergotrate ampoules (Lilly) (ampoules for injection)	

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in dehydrated alcohol will, however, be present. In fact, Moir first detected the presence of the new alkaloid while experimenting with the liquid extract of ergot made according to the specifications of the *B. P.* 1914. Ergometrine is effective in dosages of about 0.5 to 1 mg. orally, and, if this amount is present, demonstrable oxytocic action will take place.

The *B. P.* 1932 employs a different method of preparation, using fat-free ergot (defatted with petroleum ether) and a 1 per cent tartaric acid in diluted alcohol (50 per cent) as a menstruum. When the *B. P.* 1932 was published, ergometrine had not been discovered, and the physiological activity of ergot was believed to be entirely due to the ergotoxine group of alkaloids. It appears however that this method of extraction has considerable advantages over that in the *B. P.* 1914. Thompson's studies (1935) show that the carefully-prepared acid-hydro-alcoholic extracts of ergot contain all of the active principles of the drug, are rich in alkaloids, both water-soluble and water-insoluble, and remarkably prompt and effective in their action. In the *United States Pharmacopœia* also the official method requires that crude ergot be first defatted with petroleum ether and then extracted according to a standard method using 2 per cent hydrochloric acid, instead of tartaric acid and dilute alcohol, as the menstruum. Most of the non-official liquid preparations mentioned in table III are also made more or less according to the principles adopted in the *B. P.* and the *U. S. P.*, *i.e.*, they use an acid hydro-alcoholic menstruum. Many of these preparations are also standardized physiologically before being placed on the market.

Assay of active constituents of ergot

As this paper is primarily meant for practitioners, it is not intended to give the details of all the methods which have been adopted from time to time in various laboratories. The following methods are considered to be of value :—

(*a*) *The cock's comb method.*—In 1926, the *United States Pharmacopœia* first adopted a method for the biological standardization of the ergot extracts. The principle of this method lies in the fact that when a particular extract is injected into the breast muscles of a cock, the bright red colour of the comb changes, becoming darker. This colour change of the comb is compared with the colour produced by a 'reference standard' fluid extract or ergotoxine ethanesulphonate (Edmunds and Hale, 1911). This method is still in use and is thought to be a good test for measuring the specific alkaloidal activity of ergot preparations. There are, however, difficulties in the employment of this technique as the gangrene of the comb can also be produced by some of the inactive amines. Further, as ergometrine apparently does not produce any gangrene of the comb, it is likely that its presence will not be detected quantitatively by this test.

(*b*) *The rabbit uterus method of Broom and Clark.*—This method is widely used and is fairly reliable for estimating the ergotoxine group of alkaloids. It is based upon the well-known pharmacological action of antagonism of epinephrine and ergot alkaloids upon the augmentor sympathetic nerve supply to smooth muscle. This method, which has been the mainstay of pharmacologists in many parts of the world, however, suffers from the drawback that it cannot measure the ergometrine content of ergot preparations. Ergometrine has very feeble sympatheticolytic properties and hence the adrenaline contraction of rabbit uterus is not reversed by it.

(*c*) *The colorimetric method.*—In view of the chemical complexity of ergot and its preparations, it is not surprising that chemical standardization of the drug should have been looked upon with disfavour and until recently more difficult pharmacological methods have been resorted to in the assay of ergot preparations. Qualitative chemical tests were devised long ago, but prior to 1930, when Smith described a quantitative colorimetric test, no reliable method for the estimation of ergot alkaloids was available. This method is based upon the reaction of van Urk (1929) wherein para-dimethyl-amino-benzaldehyde is used to produce a blue colour which can be compared with a standard. This method measures the total alkaloidal content of ergot, including both the active and inactive members, and has now been adopted in the *British Pharmacopœia*. As ergotoxine always forms from 60 to 80 per cent approximately of the total alkaloids, this method can be conveniently used to measure roughly the ergotoxine content. It has been generally shown that figures obtained by this method agree favourably with the Broom and Clark method of ergotoxine estimation. As ergometrine also gives the colour reaction, this is the only method which attempts to estimate both types of active alkaloids in ergot.

In view of the importance of estimating ergometrine separately, Hampshire and Page (1936) have described a method by which the water-soluble alkaloids (ergometrine) and the water-insoluble alkaloids (ergotoxine group) in ergot could be determined. This method promises to be one of the most useful methods for the assay of ergot preparations, particularly in view of the fact that the estimation of ergometrine biologically is difficult. The pregnant uterus method of Thompson (1935) offers practical difficulties and the human uterus method described by Dudley and Moir (1935) and Kopp (1935) is not easily done without the co-operation of the patients and the help of an obstetrician. Brown and Dale's method (1935) of observing rhythmic contraction in a quiescent uterus has not been sufficiently tried. Until a more convenient laboratory method for biological assay is described for ergometrine, the colorimetric test, particularly by the method of Hampshire and Page (*loc. cit.*), would probably be the best way of assaying ergot preparations.

The present status of medicinal preparations of ergot on the market

A large number of official liquid extracts of ergot, both of Indian and foreign origin, have been tested during the last 10 months at the Biochemical Standardization Laboratory of the Government of India, under the direction of Brevet-Colonel R. N. Chopra. The assays were carried out both by the colorimetric method as described in the *B. P.* 1932, with the modification subsequently described in the *Addendum* to the *B. P.* 1936. These findings were checked in a large majority of cases by the '*rabbit-uterus*' method of biological assay. The results indicate that a very large proportion of the liquid extracts of ergot available in the Indian market contain either a trace of, or no active principles at all. There are a number of preparations of *B. P.* 1914 (watery extracts) which produce no colour reaction whatsoever. Tested on rabbit uterus in Dale's bath, these preparations show a pseudo-stimulation for which the

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amine content is probably responsible. Such extracts are expected to contain significant amounts of ergometrine, but attempts to obtain any colour reaction even after extraction failed. The *B. P.* 1932 preparations are better, but even these are not above reproach, as many of them do not contain enough active alkaloids to satisfy the minimum *B. P.* requirements. Though the samples are not representative of all the provinces in India, the results clearly reflect the serious state of affairs that is existing in the country. It will be apparent to every practitioner who uses official liquid extracts that many of the preparations prescribed by him could not have produced any appreciable oxytocic effect on their patients. Whatever effect was observed clinically in the case of post-partum hæmorrhage was probably due to the inherent nature of the uterine muscle to contract when the fœtus and placenta are expelled and not due to the stimulation produced by the administration of ergot preparations.

Probable causes of the poor quality of ergot preparations

At the suggestion of the director, Brevet-Colonel R. N. Chopra, intensive research is now being conducted at the Biochemical Standardization Laboratory to find out, if possible, the reasons for such a state of affairs. Until the investigation is completed, it will not be possible to make any definite pronouncements on the subject. A few general remarks may however be made as a guide to both the physicians prescribing these preparations and the manufacturers who are producing these drugs.

(*a*) *Deterioration of crude ergot.*—The ergot fungus is not present in the grain fields of this country and practically all the crude ergot is imported into the country from Spain and Portugal, and recently also from Russia. Spanish ergot has been considered the best but Russian specimens have also received high rating by several authorities. After being dried at low temperatures, the ergot is generally shipped to this country in tin containers which are supposed to be water-proof and air-tight. If kept properly, such ergot should not deteriorate rapidly. Burn and Ellis (1927) examined a sample of whole ergot which was kept in a bottle and known to be at least 14 years old, and they expressed the belief that ergot, if preserved in its original form, would lose very little of its activity, particularly when it is stored in a dry condition. As the method and place of storage cannot be always guaranteed, both the *B. P.* and the *U. S. P.* insist that ergot must not be kept longer than one year. Because of the scarcity of the drug and the Spanish war, the market price of good ergot, which satisfies all the specifications laid down above, is rather high and it becomes difficult for many manufacturers to use the high-grade crude drug for the production of liquid preparations at a competitive price. The local manufacturers in India are further exposed to the danger of buying all sorts of deteriorated and mouldy ergot which are dumped into the Indian ports for want of any drug control laws in the country. The deteriorated samples are sold at a very much cheaper rate. Any preparation made from such ergot will naturally not be found up to the standard.

(*b*) *Faulty method of extraction.*—The *B. P.* 1914 method of ergot extraction does not require a preliminary defatting of crude ergot. Evidence has slowly accumulated which indicates that, if the crude drug is first defatted, the yield of total alkaloids is very much better than under ordinary conditions. Both in the *B. P.* 1932 and the *U. S. P.* 1936, the official method enjoins that the crude drug be first defatted with petroleum ether and then extracted. Petroleum ether being a costly reagent, it is probable that many manufacturers resort to cheaper solvents, such as petrol, ether, etc. The results obtained by the use of these solvents have not been as yet carefully studied but it seems probable that these are not suitable agents for defatting purposes. It has often been seen in laboratory experiments that the same sample of ergot will give more intense colour reaction, if treated with petroleum ether than with crude petrol or ether. Further, it has been brought to the writer's notice that many manufacturers do not follow strictly the directions given in the pharmacopœias, with regard to the use of the acid hydro-alcoholic menstruum in the various stages of the extraction process. The writer's experience is too limited in this field to state that lack of attention to some of the details might be responsible for the poor alkaloidal content in the market preparations of ergot, but there seems to be hardly any doubt that some of the details described in the pharmacopœias are not without significance and should be carefully followed.

(*c*) *Imperfect assays before releasing finished products into the market.*—There are quite a number of firms who manufacture liquid extracts of ergot, without being aware of the complexities of technique involved in the process. They have not the scientific staff and expert personnel who can be entrusted with the important task of assaying the finished product. It is imperative that every batch of liquid extract should be very carefully assayed, preferably both by the chemical and the pharmacological methods, before issue. The chemical method is indeed a very handy method for an approximation of the amount of specific alkaloids present. It may be resorted to in every case before pharmacologic testing. The biological assay by the adrenaline-reversal method is a complicated affair and in inexperienced hands as much as a 100 per cent error may easily be made. If the colorimetric method gives a satisfactory yield of 40 to 60 mgm. of total alkaloids calculated as ergotoxine, there is every likelihood that such an extract would also show a satisfactory adrenaline reversal. It is

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further desirable to estimate the ergometrine content separately by the Hampshire and Page method. It has been observed that all specimens do not contain this particular alkaloid. Stoll (1935) showed that Russian ergot did not contain any ergometrine but the Spanish and Portuguese samples were rich in it. The ergot fungus produces, according to its race and habitat, sometimes one and sometimes another alkaloid. If this is true, and in view of the important oxytocic action of ergometrine, it is desirable that some guarantee should be available regarding its presence in ergot preparations. Liquid extract of ergot freshly made according to the specifications of *B. P.* 1932 from crude ergot, kindly supplied by a manufacturing concern in Calcutta (Bengal Chemical and Pharmaceutical Works, Ltd.), has been found in this laboratory to yield a satisfactory colour reaction for total alkaloids. A comparatively less intense but definite colour reaction is also obtainable when an extract from this was tested separately for ergometrine content. It should be possible to repeat such results with samples obtained from the open market.

(d) Deterioration of liquid preparations.— Perhaps the greatest disadvantage of liquid extracts is the tendency to deterioration on keeping. All ergot preparations, especially those containing water, deteriorate with age. This deterioration is a matter of importance and has received much attention during the past few years. According to the Association of American Drug Manufacturers, the deterioration is particularly noticeable within the first six months after their manufacture and then continues very slowly. Many factors, such as temperature, storage, exposure to air, hydrogen-ion concentration of the medium, have been incriminated. According to Edmunds and Gunn (1934), low temperatures are best for maintaining the stability of ergot preparations. An additional difficulty, therefore, is experienced in countries such as India where the climate is very hot and humid.

Fluid extracts of ergot prepared by the *U. S. P.* method were examined by Thompson (1930) after storage under various conditions. He found that 50 per cent loss of activity occurred in 5 years when the extract was stored in ampoules *in vacuo* at 0°C., while under ordinary conditions, *i.e.,* exposed to air, a similar loss occurred in one month. If the extract was kept in an amber bottle, half filled and corked, 50 per cent loss occurred in three months. In 1932, Swanson reported on the effect of hydrogen-ion concentration on the stability of extracts of ergot under ordinary conditions of storage. He found that, at a pH of 2.7, there was practically no loss of activity in two years while at a pH of 5.3 there was 98 per cent loss during the same period. Others have also stated that increased acidity apparently enhances the keeping qualities. Swoap, Cartland and Hart (1933), on the other hand, believe that the best method of reducing the amount of deterioration is packing in one ounce containers rather than adjusting the acidity. Most investigators (Wokes and Elphick, 1930) are however agreed on the danger of storage of the extract in bulk.

The remedy

Ergot is a drug which is chiefly used to stop post-partum hæmorrhage, an emergency condition where energetic treatment is required. The physician cannot afford to risk his reputation, and probably the life of the patient, by using preparations of doubtful strength. The liquid extracts of ergot on which the physician pins his faith have probably all been aged for a year or more before being sold and probably also have spent another year or so in the cubicle of the pharmacy before being passed on to the patient. It is very unlikely that a pound bottle of liquid extract is consumed in a retail pharmacy within a short period. The patient who gets her dose from a fresh bottle may be lucky, but there must be others who will have to be satisfied with the last dregs from a time-worn ill-corked bottle. The physician ends his duty by prescribing, the pharmacist is happy as long as he serves the prescription from properly labelled bottles, and the patient swallows the rather unpleasant mixture in the fond hope that dramatic results will follow. But can any results be expected from preparations containing, in a large percentage of cases, no specific alkaloids ?

The question naturally arises—is there any way out of such a state of affairs ? A number of proprietary ergot preparations are available on the market which are claimed to be stable and some of them are also physiologically standardized either by the 'rabbit-uterus' or the cock's-comb method. As this standardization refers only to the ergotoxine content, the presence of ergometrine, though possible, is not ensured in these preparations. Pure preparations of the alkaloids of ergot, like ergotoxine ethanesulphonate, ergotamine tartrate (Gynergen), ergometrine hydrochloride, or ergonovin hydracrylate ('ergotrate'), etc., are now available and these may be confidently used, particularly the ergometrine class of preparations. The use of purified active principles will naturally be costly and cannot be made available to most of the hospitals and dispensaries with a limited budget. Apart from the question of cost, it has its disadvantages. It should not be forgotten that, though the purified principles ensure physiological action and are invaluable in certain pathological conditions, *e.g.,* ergotamine in migraine, the extracts are perhaps best of all from the obstetrical viewpoint, since they give a combined action of both the water-soluble (ergometrine) and water-insoluble principles (ergotoxine group).

Researches are now being conducted in many laboratories in this country as well as abroad, to investigate the conditions necessary to make

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liquid preparations of ergot stable. If this aspect of the problem is solved and preparations made available to the patients, containing specific alkaloids in significant amounts to make intelligent dosage possible, much will be achieved. In the present state of affairs, it seems desirable for the practitioner to make careful enquiry regarding the freshness of the liquid preparations sold by the pharmacists who dispense his prescriptions. This is easier said than done. The other alternative is to insist that wholesale firms, at least in this country, should supply liquid extracts of ergot in small packings, preferably in one ounce containers and that drug-stores and stockists be advised to store them in a cool and dark place. Every bottle should bear the mark of careful assay and, further, the date of assay should be indicated on the container. If this is not possible, the case for using ergot powder as in the old days may be reconsidered. It has been suggested by Burn and Wokes (1929) and later again by Burn (1929) that dried defatted ergot in a dose of 1 gramme daily in a capsule should be given *post partum* in place of liquid extract of ergot. Dried ergot, especially if defatted by treatment with purified petroleum ether, retains most of its activity for at least two years when stored in a dry place. It is usually active for a much longer period.

Acknowledgment

This review of the present state of knowledge about ergot and its preparations was undertaken at the suggestion of Brevet-Colonel R. N. Chopra, the director of the laboratory, and the author wishes to place on record his grateful thanks for his permission to publish this article. A preliminary report was read at the Annual Reunion Meeting of the Medical College, Calcutta, in December 1937.

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Medical News

FAR EASTERN ASSOCIATION OF TROPICAL MEDICINE TENTH CONGRESS

THE Tenth Congress of the Far Eastern Association of Tropical Medicine will be held at Hanoi (address 'Igesante', Hanoi, Indochine) from the 24th to 30th November, 1938.

All licensed medical, dental and veterinary practitioners are eligible for membership. The membership fee for the period 1934 to 1938 is £3 (or Rs. 40-2) and should be paid to the local provincial secretaries of the Far Eastern Association of Tropical Medicine, to whom the names of members in their areas should be submitted. The members are also requested to inform the local secretaries whether they propose attending the Congress. The titles of any papers which it is proposed to place before the Congress should be submitted to the local secretaries at any early date. Arrangements will be made for the reading at the Congress of any paper submitted by a member who is unable to attend.

The Ninth Congress held at Nanking in 1934 decided that sections on food problems and sanitary measures with reference to sewage and garbage disposal should also be added to the programme of the Tenth Congress.

Further information may be obtained from the local provincial secretaries or from Lieut.-Colonel G. Covell, M.D., D.P.H., D.T.M. & H., F.R.E.S., I.M.S., Director, Malaria Institute of India, and Local Secretary of F. E. A. T. M. for Government of India, Kasauli, Punjab, or the Honorary General Secretary, Far Eastern Association of Tropical Medicine, Parapattan 10, Batavia (Centrum) Java.

UNITED PROVINCES MEDICAL COUNCIL

(Abstracted from the *Minutes of the meeting of the United Provinces Medical Council held at Lucknow on 25th March*, 1938)

RESOLVED that the name of Dr. Muzaffar Ali, M.D. (Vienna) of Bhopal may now be registered.

The applications for registration of Drs. Bertha Chase and Mildred E. Burton of Clara Swain Hospital, Bareilly, were considered to decide whether the M.D. qualifications of the University of Vermont (U. S. A.) and University of Louisville Medical School (U. S. A.) be accepted as registrable qualifications and added to the schedule.

Resolved that the applications be rejected. The registrar was, however, asked to direct the attention of the applicants to rule 5 on pages 18 and 19 of the United Provinces State Medical Faculty Rules.

Resolved that the following be added as paragraph 5 in the application form—

'When registered, I promise to abide by the rules and regulations framed, or to be framed from time to time hereafter, by the United Provinces Medical Council under the United Provinces Medical Act, III of 1917'.

Resolved that the amount charged for reciprocal registration be raised from Re. 1 to Rs. 5 as in Bengal.

SUMMARY OF TUBERCULOSIS NEWS FOR APRIL 1938

INDIA is represented at the International Union against Tuberculosis through the King George Thanksgiving (Anti-Tuberculosis) Fund. The Fund Committee has nominated Major-General E. W. C. Bradfield, C.I.E., O.B.E., K.H.S., I.M.S., and Dr. A. C. Ukil, as councillor members for the year 1938.

His Highness the Maharaja of Nawanagar recently laid the foundation stone of the tuberculosis sanatorium on the Bhuj-Bharatpur road, Cutch.

A press communiqué issued by the Nizam's Government surveys the medical and public health department's work in fighting tuberculosis. Besides the 150 hospitals and dispensaries where tuberculosis cases are treated, there are two special tuberculosis clinics and a new one is being built at Dhabipura. A special tuberculosis hospital at Lingamapalli will be completed within the next three months. Plans have been completed for a sanatorium at Anantagiri about 50 miles from the city.

The Mayor of Bombay has inaugurated a campaign in aid of Her Excellency the Marchioness of Linlithgow's appeal for the King-Emperor's Anti-Tuberculosis Fund by starting a 'Rupee Fund'. Numbered receipts will be given to all donating one rupee. Arrangements have been made for donations to be made through banks, petrol stations, garages and big stores.

In the first instance 100,000 tickets are being issued and every donor stands a chance of winning one of the 100 prizes from Rs. 5,000 downward. Altogether Rs. 19,000 will be distributed in prizes for the numbered receipts. The numbers have already been chosen by Lady Lumley. Immediately Rs. 1,00,000 has been collected, the above prizes will be distributed and a further drive for another collection of Rs. 1,00,000 will be made with similar prizes.

INSPECTION TOUR BY THE VICEROY OF DELHI ANTI-MALARIA SCHEME

'A WELL-GOVERNED city should possess a sound water-supply, should be reasonably free from overcrowding, should be adequately drained and sewered, and should be protected so far as is reasonably possible from endemic and epidemic disease', said His Excellency the Viceroy, while informally addressing press representatives at the Muttra road sewage disposal works, after he had finished an inspection tour of certain works carried out by the Delhi Improvement Trust.

'In these days', he said, 'when the Government of this country is becoming more and more a matter of persuasion, it is in my opinion wise to miss no opportunity of educating public opinion and of quickening the social and civic conscience.

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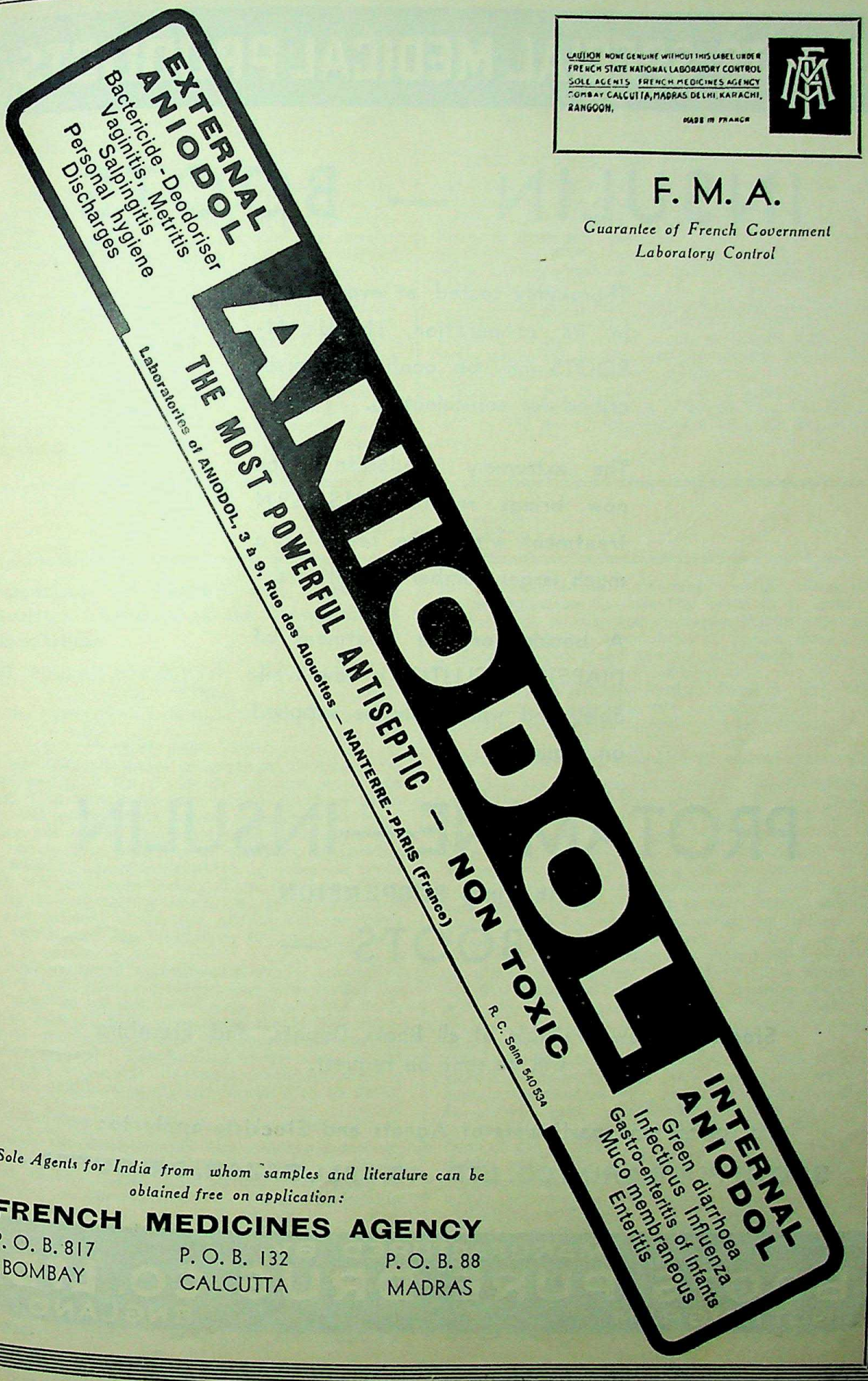

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Delhi has a sound water-supply, though even the recent extensions, which raised the capacity to 21 million gallons per diem, are unlikely to suffice for very long. The peak demand of 1937-38 was 17 million gallons per diem and the Joint Water Board are now actively considering further extensions. In other respects, however, conditions fall far short of reasonable standards, and the works now in progress, or projected, are intended to relieve overcrowding, to provide for the efficient disposal of sewage and to protect the city and New Delhi from malaria.

MOSQUITO BREEDING GROUND

I saw some of the extensions and other works of the Trust on 17th March. The works seen on the present tour include the largest individual anti-malaria work, one smaller anti-malaria work and the new sewage disposal system. The anti-malaria works are designed to facilitate control of mosquito breeding by the elimination of extensive breeding grounds. On this side of Delhi and New Delhi they extend from Metcalfe House in the north to the Purana Kila and the Barapula Nala in the south and the idea underlying them is the same, namely, regrade drains and open surfaces so that flood and storm water may in all, save very exceptional years, run off before breeding can take place.

The original programme, which was estimated to cost Rs. 14.79 lacs and included a few lesser works to the west of the city and important canal closing scheme in the Pul Mithai neighbourhood, has made good progress and almost all the works are complete. This canal closing scheme however remains and will, it is hoped, be taken up in 1938-39. New money is being found to regrade one more drain in the Jumna village neighbourhood and to straighten and pitch the Darhalia Nala and to improve the Najafgarh drain into which the Darhalia Nala falls. The additional expenditure in 1938-39 for these certain other works will be about Rs. 2.4 lacs'.

NEW VACCINE TO CONTROL ANTHRAX

AN anti-anthrax vaccine believed to be a considerable improvement over existing products for the control of anthrax has been evolved at the Imperial Veterinary Research Institute, Muktesar, and will be shortly available, according to the director of the institute, whose annual report for the year 1936-37 has just been published.

The material for the vaccine was obtained from the Director of Veterinary Services, Burma, and the vaccine prepared on the method in use in South Africa. The tests conducted at the institute on the vaccine have yielded highly satisfactory results.

Work on the manufacture of a tetanus anti-toxin is also in progress and it is hoped that the institute will in the near future be able to issue this product also.

Current Topics

A Comparison of Insulin and Cardiazol Convulsion Therapies in the Treatment of Schizophrenia

By H. PULLAR STRECKER, M.D. (Würzburg), L.R.C.P. (Edin.)

(From the *Lancet*, Vol. I, 12th February, 1938, p. 371)

DEMANDS UPON TIME

AN undoubted advantage of cardiazol treatment is the great saving of time; also its management is less exacting. Convulsions are induced two or three times a week, and as the whole process does not take more than five minutes of the doctor's time, he, with the aid of two or three nurses, can treat 40 to 50 patients in one morning. Insulin treatment is given six times a week, each treatment lasting about five hours from beginning to end, during which the doctor must not leave the patients. With the aid of two or three nurses, one doctor can treat 8 to 10 patients in one morning.

The after-treatment necessitates a similar amount of work with both methods, except that with insulin the nurses must be capable of dealing with after-shock, should it appear. Both treatments should be accompanied by psychotherapeutic encouragement and by occupation therapy. The duration of the whole course of treatment is roughly the same; cardiazol requires an average of 6 to 8 weeks and insulin 8 to 10 weeks.

ADJUSTABILITY TO CLINICAL REQUIREMENTS

Although the more lengthy and exacting procedure, insulin treatment has the advantage that it can be adjusted to any degree from mild hypoglycæmia to deep coma; cardiazol convulsions are not adjustable, and only the number induced is subject to control. Contrary to expectation, the biochemical changes produced by the two methods have much in common; the effects of cardiazol, however, are fully spent in a minute, whereas those of insulin extend over hours. Thus the element of shock does not predominate in insulin treatment; quite a number of patients recover without the necessity of reaching the coma stage, and the gradual mental 'unfolding' which takes place during hypoglycæmia—layer by layer so to speak, as witnessed by lucidity and increasing insight—shows the unique therapeutic possibilities of insulin treatment.

Since the depth and duration of hypoglycæmia, and the time and method of terminating it, can be suited to clinical requirements, insulin affords a wide therapeutic range, and different techniques are in use according to the clinical type of schizophrenia.

MORTALITY-RATE, COMPLICATIONS, CONTRA-INDICATIONS

In the hands of the experienced, the mortality-rate of the two treatments is equally low. It was 1 per cent among the first 700 insulin patients, and 0.5 per cent among the first 600 cardiazol patients, but with accumulating experience it fell to 0.4 per cent among 500 patients recently treated in Switzerland. There is less likelihood of emergencies arising with cardiazol than with insulin hypoglycæmia, where laryngeal spasm, failure to awake from coma, or cardiovascular collapse may be encountered. Cardiazol is more unpleasant to the patients, but their apprehension can be alleviated by giving, 30 to 45 minutes before the injection, morphine sulph. gr. 3/8, hyoscine hydrobrom. gr. 3/200, and atropine sulph. gr. 1/100. I prefer premedication with insulin, which completely eliminates unpleasantness.

The contra-indications—namely, any form of cardiovascular disease, as well as respiratory, renal, or hepatic disease—are the same for both treatments. So are their principal after-effects (occasional vomiting or transient attacks of tachycardia). Passing alterations of the T wave appear to be more common with insulin while with cardiazol luxation of the jaw or arm has been known to happen.

The fact that most patients gain weight while undergoing either form of treatment shows that there is no detrimental effect on their general health. The question whether or not hypoglycæmia and induced convulsions are as harmless to the brain as clinical observation suggests, remains an open one, but the results of recent animal experiments are reassuring in respect of hypoglycæmia as well as of induced convulsions.

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PERMANENCE OF BENEFIT AND INCIDENCE OF RELAPSE

As regards permanence, treatment is too recent to admit of far-reaching deductions; however, a high proportion of the recoveries obtained in Vienna and Budapest four and three years ago, when treatment was begun, has been maintained. It is difficult to differentiate between the incidence of relapse of the two methods, for only one reference regarding cardiazol has been published. Angyal and Gyárfás, treating 44 patients with cardiazol, obtained 17 complete or incomplete remissions and report 4 relapses (23 per cent). With insulin Frostig treating 53 patients (27 complete remissions) had 4 relapses (15 per cent). Béno treating 49 patients (35 complete, incomplete, or partial remissions) had 5 relapses (14 per cent), while Müller, surveying 495 Swiss patients (200 complete or incomplete remissions), noticed 13 relapses, which is only 6.5 per cent.

It should be pointed out that, with either method, poor results or relapses may be often due to the technical error of not giving a long enough course of treatment.

REACTION OF CLINICAL TYPES OF SCHIZOPHRENIA TO THE METHODS

The methods are not equally effective with all types of schizophrenia. Hebephrenia and dementia simplex both give relatively poor response to either method; in the other types the order of improvement with cardiazol is generally inversely that with insulin. For example, catatonic excitement and paranoid types are more responsive to insulin, whereas stupor responds better to cardiazol. This is of practical importance and shows the value of combining or of alternating the two methods, since patients proving refractory to cardiazol may readily respond to insulin and *vice versa*. Angyal and Gyárfás, by supplementing the treatment of those refractory to cardiazol by a period of insulin, found their remission-rate increased from 44 per cent to 63 per cent.

CONCLUSION

The results obtained with insulin and cardiazol convulsions in the first years of illness show that they constitute a decided advance in the treatment of schizophrenia. It would be a mistake to neglect either method, or to practise one to the exclusion of the other. Both have their clinical indications and they can be selected according to the technical facilities available. A combination should be attempted wherever suitable, and their alternate use is recommended in refractory cases.

Injection Treatment of Inguinal Hernia

A RESUMÉ OF A POST-GRADUATE LECTURE AT ST. MARY'S HOSPITAL

By A. E. PORRITT, M.Ch. (Oxon.), F.R.C.S. (Eng.)

(From the *Lancet*, Vol. II, 9th October, 1937, p. 835)

THE rationale of the injection method of treating inguinal hernia is to fill up the inguinal canal with fibrous tissue, produced by the injection of a chemical irritant, to such an extent that, first, a hernial sac cannot get down the canal, or, secondly, contents cannot enter a pre-existing congenital sac.

HISTORY

The method is by no means new. Approximately 100 years ago it would seem to have had a considerable vogue in America and in France. Its originator was George Heaton of Boston, who published his results in 1843 and subsequently in book form (1870). Closely associated with him was Warren, also of Boston, and their methods were copied by Velpeau of Paris. Heaton himself used 'quercus alba' as his chemical irritant; his American co-workers and Velpeau tried iodine, Lugol's solution, cantharides, and several mixtures of essential oils. They all adopted the procedure of one massive injection, the patient being—of necessity, one imagines!—confined to bed.

The advent of antiseptic and, later, aseptic surgery, and the publication between 1880 and 1890 by Halsted and Bassini of their operative methods for the treatment of hernia, led to the relegation of the injection idea. With the exception of the work of two men this state of affairs persisted until five or six years ago, since when, in America, a great deal of investigation has been carried out and innumerable papers published on the injection technique. The two who filled in the intervening period were Ignatz Mayer of Detroit and Pina Mestre of Barcelona, to whom must be given the credit for the present-day ambulant method of treatment. Mayer, working over a period of thirty years, and using a solution the essential constituents of which were zinc sulphate and carbolic acid, produced a series of 2,000 cases in which he claimed 98 per cent success. Pina Mestre, using a tannic acid solution, published in 1927 a series of 10,000 cases, showing almost equally good results, and no fatalities. Such figures promoted ardent research in America, with the result that there the method is to-day well approved and widely accepted. In England, apart from the work of Delisle Gray, it seems to have found very little recognition.

The series of 100 cases described here is the result of an attempt to evaluate the therapeutic and economic possibilities of the method. As the ultimate result of the treatment seemed the most important factor to be considered, they have been selected from about 150 cases as being those which it has been possible to follow up for periods varying from three years to six months. The remainder consists of those who have too recently come under treatment, those with whom it has been impossible to keep in touch, and those, only eight, who failed to complete their treatment. Before considering the selected 100 in detail certain general aspects require mention.

ANATOMY AND HISTOLOGY

Even at the risk of being obvious one cannot overemphasize the importance of a sound knowledge of the anatomy of the inguinal canal and its contents. Injections should be made deep to the aponeurosis of the external oblique and extend at approximately regular intervals from the crossing intercolumnar fibres of the external oblique at the external abdominal ring on the inner side to beyond the internal ring on the outer side, and from the conjoint tendon above to the inguinal ligament below.

Nelson and Rice have conducted an admirable series of experiments on both animals and men, which demonstrate the histological changes following injection. Their results may be briefly summarized as follows:—

6–15 hours: polymorph leucocytic response with occasional round cells and some œdema.
24 hours: signs of transient cellular necrosis.
5th day: evidence of fibroblasts.
8th day: many fibroblasts and new blood vessels.
14th day: definite fibrous tissue formed.
42nd day: dense scar tissue.

In other words, the histological result is a 'foreign body granuloma'. The earlier stages of these changes I myself confirmed on guinea-pigs, late results being unavailable owing to overdosage adversely affecting the life of the animals concerned!

CHOICE OF CASE

This paper deals only with inguinal herniæ, although it includes recurrent herniæ that are really 'incisional'. But many workers have successfully used the method for femoral, umbilical, and ventral herniæ, and there seems no reason why the technique should not be judiciously extended to all types.

Sex is immaterial. Inguinal hernia is relatively much less common in women, but the method can be equally well applied in them, the anatomical differences making the technique slightly more difficult. Inability to invaginate the labium majus into the inguinal canal

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makes localization of the needle point by touch impossible, but on the other hand the bogy of the spermatic cord is removed.

By experience one has found that the important factors in selecting cases are the size of the external abdominal ring and the amount of fat in the subcutaneous tissue of the groin. All herniæ of course must be completely reducible. The size of the actual hernia is of small import so long as it can be efficiently retained by a truss. But it has been found that in general with an external ring that admits two fingers treatment is likely to prove difficult or at least prolonged, and that the more fat there is overlying the inguinal canal the less likely are injections to be well placed. It seems probable that excessive subcutaneous fat, apart from increasing technical difficulties, implies, firstly, excessive extraperitoneal fat in which injections seem to cause more necrosis and less fibrosis, and, secondly, poor muscle power, with the consequent liability to further strain being thrown on an already weakened area.

Thus the young adult, with good musculature and minimum subcutaneous fat, appears to be the ideal type for injection. One more requisite he should have —enough intelligence to co-operate in his treatment, particularly in the wearing and non-removal of his truss. For this reason alone children are in general not suitable cases.

The only other contra-indications worthy of mention are imperfectly descended testicle, the sliding type of hernia (if diagnosed), infective skin conditions of the groin, and hæmophilia. Such conditions as active venereal disease, ascites, or pregnancy, will obviously preclude the possibility of injections. But for chronic renal disease, diabetes, pulmonary tuberculosis, etc., which have in various papers been given as contra-indications, the method would seem to me to have a very definite field of utility. My series includes successful cases of all three conditions.

THE TRUSS

An essential adjunct, and to some extent a drawback, to the injection treatment is the wearing of a truss continuously during the course and for some time afterwards. The object of this support is to prevent any strain being thrown on the newly formed granulation tissue before it has had time to consolidate and become firm fibrous tissue. A well-fitting and comfortable truss is therefore of the utmost importance as it has to be lived in for some months, day and night—and in the bath! For this reason I have devised a truss, which has been made for me by Messrs. Weiss and Son, London, W.1, to cope with these requirements. It consists of a vulcanized hard rubber pad attached to a steel spring coated with the same material. This has the advantages of being cleanly, light, immersible in water and, after preliminary heating, capable of being moulded exactly to the contours of the individual patient. Small studs allow of rubber straps (abdominal and perineal) being fitted and used as required. In many cases they are not needed at all and patients' testimonies convince me that this type of truss is very satisfactory in all respects. Most patients in this series have done manual work—often very heavy—in them, and many have played games and even enjoyed the luxury of swimming while under treatment.

I always advise that the patient should wear the truss, and sleep in it, for a week or two before injections begin, so that he may be thoroughly used to it. Once treatment begins it must be removed only at the actual time of injection and then preferably by the surgeon.

SOLUTIONS

There appears to be as yet no unanimity of opinion upon the ideal solution to be used. This should be painless when injected, give no general systemic reaction, be non-toxic if injected intravenously or intraperitoneally, non-injurious to the tissues locally, and capable of producing the maximum fibroblastic reaction with the minimum of exudation. The solution used in this series—that of Mayer (zinc sulphate 1 dr., phenol crystals 6 dr., glycerin 4 dr., aqua cinnamoni 1 oz., sterilized redistilled water 2 oz.)—admittedly does not fulfil all these requisites. It produces good and non-harmful local results and no general reaction, but often gives some pain and is toxic if injected intraperitoneally—and probably therefore intravenously. Now that this series is completed I intend to transfer my allegiance from a caustic adhesion-producing solution like the above to an astringent proliferation-producing solution of which the best to date appears to be Galtanol—a mixture of tannic and gallic acids, as used by Fowler in a series of 700 cases—Proliferol, or Sylnasol—a solution of sodium psylliate, used by Harris and White in a series of 100 cases, and by Biederman. The original Pina Mestre solution with a tannic acid basis has been approved (1936) by the American Medical Association Council on Pharmacy and Chemistry, and used extensively by Jameson. Winters has employed colloidal potassium guaiacol sulphonate, and McMillan and Cunningham a mixture of phenol, alcohol, and tincture of thuja. Even sodium morrhuate has its supporters.

TECHNIQUE

The patient lies upon a couch. In the average case there is no need to adopt a slight Trendelenburg position or to place a pelvic rest under the buttocks, although these manœuvres may be of assistance in dealing with the early stages of a big hernia or with an obese patient. The truss is then removed and the pubic hair cut with scissors. It is better not to shave as this often leads to dermatitis and discomfort under truss pressure. The spot chosen for injection is locally anæsthetized. At first this can be accurately determined by a finger invaginating the scrotum into the inguinal canal. Later surface landmarks or the results of previous injections must be the guides, and towards the end of treatment a small cough with the patient lying and a finger covering the inguinal canal will demonstrate residual weak spots.

The needles used are 22 or 23 gauge with a medium bevel. The needle is inserted vertically to the skin surface and will be found to meet two resistances—the skin and the aponeurosis of the external oblique. Just deep to this latter is the correct level for injection. Preliminary aspiration to exclude the needle being in a blood vessel should always be done.

The dose will of course vary with the solution used. A preliminary 0.5 c.cm. followed subsequently by 1 c.cm. doses has been used with Mayer's solution. Injections can be given bi-weekly or even at shorter intervals according to the reactions of the individual patient. It is most important that they be given very slowly. The first drop will probably give an unpleasant stinging sensation, which however passes off in a few seconds —the remainder of the injection being practically painless. The patient should be made to describe the position of the initial sensation as this may help considerably in localization. If pain in the testicle is complained of, the point of the needle is too close to the cord and must be moved accordingly. Vague pains moving across the pubis, towards the anterior superior spine, to the perineum or the thigh are of little significance. But any mention of abdominal pain is a danger signal implying that the sac or even the peritoneum proper have been penetrated. In this case the injection must be stopped immediately.

At a period varying from half an hour to three hours after the injection a feeling of vague discomfort develops in the groin of varying intensity, according to the type of patient and the stage of treatment. This discomfort is not sufficient to interrupt either the patient's work or his sleep, although it may last for as much as twelve hours.

Opinion varies about the end of the inguinal canal which should be injected first, the majority of workers starting at the outer limit or internal abdominal ring. I have favoured the external ring for the first injection, since localization is then very exact, and further, any possible risk of incarceration is thereby avoided.

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When treatment has reached the stage of there being no visible or palpable impulse on coughing with the patient recumbent, he is then given a fortnight's rest still wearing the truss. If on re-examination all is satisfactory, the truss is discarded at night. Two weeks later, all being well, gradual removal of the truss for an increasing number of hours daily is allowed, this stage taking about a month varying with the occupation and intelligence of the patient. Thus it will be seen that some two months elapse from the time of the last injection to the time of complete discarding of the truss. Allowing for a preliminary wearing of the truss for a week or two before injections begin, and for an average of 10 to 12 injections at bi-weekly intervals, the whole treatment takes about four months—during which of course it must be remembered the patient is ambulant and able to live a normal life and carry on his usual occupation.

RESULTS

The 100 cases under consideration have all been injected during the last three years and have been followed up for a period of not less than six months.

Of the 100 patients 97 were males and three females. This does not give a true idea of the relative sex frequency, as the method was only extended to females this year. The average age of the patients was 38, the oldest being 66 and the youngest 17. Of the hundred, 64 were employed in manual labour, often of the hardest kind, and 36 in sedentary occupations.

The 100 patients were responsible for 110 herniæ. Of these 69 were right sided and 41 left, these figures including 10 bilateral cases. The herniæ were simple bubonoceles in 82 cases, and either scrotal or labial in 28. Five cases of recurrent herniæ after operation were dealt with. The average interval between the appearance of the hernia and the beginning of treatment was two years, the shortest period being one day and the longest eighteen years.

For these 110 herniæ, 1,032 injections have been given, an average of approximately 9.4 per hernia. The average number of injections required to close the external abdominal ring was four.

Of these 1,032 injections, three have been considered as intraperitoneal. The result was very alarming, the clinical condition being one of severe shock. This came on very rapidly—within a few moments, and passed off equally rapidly within half an hour. Treatment was complete rest, brandy by mouth, heat to the abdomen, and, in one case, an injection of adrenaline, in another of coramine. All three cases left hospital within two hours of the injection and appeared none the worse afterwards.

Some 14 injections, apart from these three, produced severe reactions, either in the direction of immediate acute pain or of later prolonged swelling, tenderness, and discomfort. Occasionally, transient swellings in the upper part of the scrotum were noticed, particularly after early injections. These are typically painless. No case of testicular atrophy has been observed, and one patient with a bilateral hernia has since injection successfully sired a son.

Two cases are definitely failures, both these being elderly men of adipose build and having big scrotal herniæ coming through a very enlarged external ring. In both cases the hernia was reduced to the inguinal canal, but it proved impossible to hold them back in this region. There were five cases that came into another category—'recurrence'. One feels that in these, recurrence simply expresses inadequate treatment, although two of the five came back over a year after apparent cure. All responded satisfactorily to further injections.

ECONOMIC ASPECT

It is chiefly the able-bodied young to middle-aged adult who becomes afflicted with hernia, *i.e.*, the productive worker. If this class can in the main be saved from hospitalization and loss of wages the economic advantages are self-evident. While admitting that generalities are misleading a minimal estimate of the position in this country produces interesting figures. On the basis of a weekly wage of £2 10*s.* and hospitalization costs of £3 per week, the injection treatment effects at a conservative estimate a saving of £25 per patient either to the patient, the hospital, or the charitable aid societies. If 50 London hospitals operate on 100 cases each per year that might equally well be treated by injection, the loss in work, wages, and hospital costs amounts to £125,000, and if London accounts for 25 per cent of the hernia cases treated annually in the country, the figures mount up to half a million sterling. Only a keen desire to avoid exaggeration leads one to quote nominal figures which probably but half represent the case. It seems that this aspect of the treatment alone would make it worthy of careful consideration by hospitals, charitable aid societies, insurance companies, public health bodies, the Services, and even perhaps the Ministry of Health itself.

Two other considerations are worthy of mention A general acceptance of the treatment would free a large number of hospital beds annually for the reception of more acute or more worthy cases. On the analogy of American figures (Biederman) it seems probable that there are some 2,000,000 hernia cases in this country going untreated because the people concerned either cannot afford operative cure or are frightened by the thought of operation. Such people represent a big entry on the debit side of the physical fitness ledger of the country.

CONCLUSIONS

Recurrences after operation, even in the hands of the best surgeons and when large series of cases are considered, give the unpleasantly high figure of about 10 per cent. Max Page in one series even found it as high as 25 per cent. Fallis in a series of 1,600 cases arrived at a figure of 7.5 per cent. Injection offers a better prospect than this—7 per cent in the present small series and figures as low as 2 per cent to 3 per cent in much larger series in America.

This result is achieved without any of the risks of anæsthesia or surgical interference. Complications are of a minor nature and relatively few in number; no mortality at present has been reported.

Both operation and injection aim at repairing the inguinal canal weakness by fibrous tissue formation. The former leads to a definite uncontrollable amount being produced which may or may not be sufficient to effect its purpose; the latter to a regulated and requisite amount, which even in the event of a 'recurrence' can be increased or replaced by a few additional injections.

It is certainly not intended to imply that the injection treatment is the 'cure-all' of hernia. It has obvious limitations, but within those limitations it would appear from the present series to be so free from risk, painless, economic, and efficacious as to merit an extended and prolonged trial.

Cholecystitis

By J. W. McNEE, D.S.O., M.D., D.SC., F.R.C.P. (Lond.)

(From the *British Medical Journal*, Vol. II, 1937, p. 731)

THE subject of gall-bladder infection has been discussed in recent years at many times and in many places, especially by hospital physicians and surgeons. It is a good choice for discussion at an Annual Meeting of the British Medical Association, because its great frequency and clinical importance may then be emphasized to the general practitioner, who, after all, has the main opportunity and responsibility of recognizing inflammation of the biliary tract in its earliest and most important stages.

The combined results of many observations, by physicians, surgeons, and pathologists, seem to show without any doubt that disease of the gall-bladder is now the commonest of all organic troubles of the digestive tract. This has been repeatedly stated by

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Hurst. Statistics in different countries and in different clinics must vary, but Piersol has recently published an analysis of the admission to the gastro-intestinal clinic of the University of Pennsylvania Hospital, Philadelphia, and shown that 16.3 per cent of all the patients were diagnosed as suffering from gall-bladder disease. Duodenal ulcer, cancer of the stomach, gastric ulcer, and chronic appendicitis followed, in this clinic, in order of frequency, but these are merely the results in one American hospital. I am unable to present the statistics of any large series of gastro-intestinal cases in Britain, but it may safely be accepted that cholecystitis is now established here as one of the most common and important intra-abdominal diseases.

It is obviously my duty in opening this discussion to give a general survey of the problem before us and not to spend undue time on matters which will be dealt with in greater detail by subsequent speakers.

Age, sex, and type of patient

It must nowadays be realized that the female who is 'fat, fair, forty, and fecund' is by no means the only type subject to biliary disorders and to their common sequel of gall-stones. It is true that cholecystitis is more common in females than in males, for reasons which have many times been discussed and which need not detain us now. Gall-bladder troubles are, however, quite common in men, and it may be emphasized that cholecystitis occurs in young men and young women, and even in children. These facts are, I think, not yet sufficiently and universally realized. With the increase of outdoor games and exercise in young people this disease may diminish; but there are many, mostly living in cities, who have sedentary occupations in offices and factories and are prone to dyspepsia and biliary disease. In acholuric jaundice, a disease generally recognized in youth, there is a special tendency to disorders of the biliary tract—both pigment stones and cholecystitis.

Ætiology

I have already referred to sedentary occupations as increasing the risk of cholecystitis, and indeed the factor of biliary stasis is the only important predisposing cause on which almost everyone will agree. It would not be justifiable here to discuss disturbances in the physiology of the biliary tract as a cause of biliary symptoms, since so little is known with absolute certainty. Problems concerning the sphincter of Oddi, contraction of the gall-bladder, and spasm of the main bile ducts are all involved here; and frankly, in my view, the time has not yet come to bring questions of disturbances in the physiology of the biliary tract into the realms of ordinary practical medicine. We have enough to deal with at present in gall-bladder pathology, due to microbic infection of the gall-bladder and biliary tract, the essential cause of the subject we are discussing, namely, cholecystitis. Here, too, we are faced with the difficulty of reconciling the divergent views of physicians and surgeons for the ultimate benefit of our patients. This matter will no doubt be examined fully by Sir Arthur Hurst and Sir David Wilkie, and I need only place the general position before you.

The points of importance are:

1. What are the common microbes which infect the gall-bladder, and what is their relative frequency?
2. By what route is the gall-bladder infected—by passage along the ducts from the intestine or by the blood stream? Do the microbes in fact exist mostly or partly free in the bile, or is the infection essentially deep-seated in the wall of the gall-bladder?

The importance of focal sepsis in teeth, tonsils, appendix, or elsewhere in the ætiology of cholecystitis is an essential part of the problem, which I only mention to give a lead to other speakers.

Varieties

Cholecystitis with gall-stones.—It is obvious that in the past the diagnosis of cholecystitis was seldom made before the common sequel of gall-stones had occurred and given rise to obvious signs or symptoms. Even nowadays the frequent accidental discovery of gall-stones of inflammatory origin at post-mortem examinations shows either that a diagnosis was missed or that the symptoms were insufficient to make the patient seek treatment for biliary disease. It must be remembered that in patients who have already developed gall-stones recurrent attacks of cholecystitis are common and often severe.

Acute infective cholecystitis.—This is a surgical emergency and needs no discussion.

Catarrhal cholecystitis.—This is the variety I wish to bring into the forefront of discussion to-day. It is due to infection with organisms of obviously low-grade virulence, and often smoulders on without giving rise to serious or acute symptoms for a long period of time. It is difficult to diagnose, but if untreated is likely to be followed by gall-stones and many other complications.

Symptoms and diagnosis

Moynihan, in the days of the rapid development of gall-bladder surgery, described the 'inaugural symptoms of gall-stones'. These, we know now, were the symptoms of the preceding cholecystitis, but at a later stage than we must now identify them. At that time it is fair to say that the early stages, except of the acute and fulminating variety constituting a surgical emergency, were seldom if ever sought for or recognized. It is the diagnostic problem involved in the common catarrhal cholecystitis that I wish to emphasize, and a correct diagnosis will often be missed and treatment too long delayed if the doctor fails to investigate further all cases of dyspepsia which do not respond to simple treatment. He may, and generally does, consider the possibility of gastric or duodenal ulcer, and is disappointed when the *x*-ray examination by barium meal which he advises yields a negative result. He may think of chronic appendicitis; but up to the present he too seldom thinks of the great frequency of gall-bladder disease as a cause of dyspepsia. The association of flatulence with the dyspepsia is suggestive, but by no means conclusive.

It is best at the very outset, when considering how the diagnosis of gall-bladder infection may be proved, to admit the difficulties involved. The diagnosis by simple clinical methods is easiest when gall-stones are present. Biliary colic occurs in roughly 40 per cent of such cases, while recurrent acute attacks of cholecystitis lead to obvious signs in the right upper quadrant. Further, it is in these cases that cholecystography is of such great diagnostic value. Even when gall-stones are absent the local signs of tenderness or pain or both below the right costal margin may, along with the presence of flatulent dyspepsia, strongly suggest the diagnosis. The real difficulty arises in the cases—and they are many—in which a catarrhal cholecystitis is associated with dyspepsia only, without local pain or tenderness over the gall-bladder at all. These are the early cases in which medical treatment may be of avail. How are such cases to be completely and positively diagnosed so that proper treatment may be carried out? Ordinary simple clinical methods fail us here—what help can we obtain by other methods?

I must first refer to cholecystography, but omit any lengthy discussion. I will only say that in my experience, which is now considerable, the use of the dye followed by *x*-rays generally does not yield information of positive diagnostic importance in the early cases of catarrhal cholecystitis in which physicians are so interested. I am too often confronted with an *x*-ray diagnosis of 'pathological gall-bladder', or 'poor filling', or 'faintness of shadow', which are taken to indicate disease, when I know full well the differences in technique and the differences in absorption of the dye, even on different days in the same person. On the whole I am still very chary of accepting a diagnosis of early cholecystitis on *x*-ray evidence, whatever improvements in technique may later make possible.

We now come to the method of duodenal intubation, and here I feel on quite different and much more

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secure ground. I would go so far as to say that in early cholecystitis it is at present the only diagnostic method on which we can positively rely. It is far too little used in Britain, but is a routine method in America and elsewhere. I have indicated in a recent paper some of the reasons why it has not yet obtained its proper place in diagnosis with us; and I feel this defect must be remedied. Perhaps, as in many tests of this kind, too much was at first claimed for the method; but of its diagnostic value in experienced hands I have no doubts at all.

DIFFERENTIAL DIAGNOSIS

This is at times easy, but is often difficult unless the technique of duodenal drainage is employed. This section might easily detain me too long, for the differential diagnosis from chronic gastritis, pylorospasm, peptic ulcer, carcinoma, and peripyloric adhesions would require consideration. Moreover, peptic ulcer and chronic cholecystitis may coexist: I have seen a number of examples of this combination. The clinical differentiation between cholecystitis and chronic appendicitis is not easy; and here again the duodenal tube may be the only real help. Diseases of the liver itself, especially early cirrhosis, are frequently confused with gall-bladder infections. I have made this mistake too often and have seen the cirrhotic liver exposed by the surgeon when my confident diagnosis was chronic cholecystitis. I deliberately omit more than a reference to important diseases situated outside of the abdomen—such as coronary thrombosis—which have frequently been mistaken for cholecystitis.

TREATMENT

I will only deal with some general principles. I have already alluded to the difficult problem of deciding on the site of the microbic infection and the important bearings the solution of the problem must have on treatment by drugs excreted in the bile. Next I must refer especially to the form of treatment now commonly known as 'non-surgical drainage of the biliary tract'. This treatment began with the use of the duodenal tube, repeated emptying or rather partial emptying of the gall-bladder being induced by the direct injection through the tube into the duodenum of either a concentrated solution of magnesium sulphate or olive oil. Later it was found in practice that the passage of the duodenal tube was unnecessary, the same drainage of the biliary tract being obtained by giving the patient a small dose of concentrated magnesium sulphate solution on an empty stomach. I am convinced of the great value of this form of treatment when persisted in daily for months.

As regards diet in the treatment of early cholecystitis and the prevention of gall-stones, I am far less strict (except when obesity forms part of the problem) than are many physicians. I do not see the need for restriction in cholesterol-containing foods, since the body can obtain a supply from so many foods. The only essential restriction is cooked fat, and especially 'fried foods', which aggravate the common flatulent dyspepsia. I do not exclude butter or milk in moderate amount and olive oil (a food) has great value in preventing flatulent dyspepsia and in emptying the biliary tract, although it does *not* dissolve gall-stones.

It must be remembered that in cholecystitis the liver itself is damaged or deranged in function, and a sojourn for treatment at a spa which specializes in hepatic diseases and in the other frequent accompaniments of cholecystitis, such as obesity, may be of great value. Disordered function of the liver, so commonly associated with cholecystitis, is claimed by some to be concerned in the ætiology of migraine, but I must state that I have never seen migraine in direct association with hepatic disease.

CONCLUSION

In conclusion, my plea is for the more general recognition of the great frequency of cholecystitis, of the difficulties that must be faced in making a correct diagnosis, of the methods that are of real practical use in diagnosis and treatment, and of the great diagnostic value of the duodenal tube. Further, I would express my belief that catarrhal cholecystitis can be cured in its earliest stages by medical treatment, and that in this way we may hope to diminish the incidence of gall-stones with their frequent dangers and complications.

Reviews

THE MEDICAL ANNUAL: A YEAR-BOOK OF TREATMENT AND PRACTITIONER'S INDEX.—Edited by H. L. Tidy, M.A., M.D. (Oxon.), F.R.C.P., and A. R. Short, M.D., B.S., B.Sc., F.R.C.S. Fifty-Sixth Year. 1938. John Wright and Sons Limited, Bristol. Pp. lxxi plus 696. Illustrated. Price, 20s.

UNDOUBTEDLY the most important medical event of recent years has been the introduction of the sulphanilamide group of drugs, and we do not consider that it is any exaggeration to place this beside Ehrlich's introduction of the arsphenamines in assessing its historical importance. The medical journals of to-day seem to be largely devoted to records of the latest triumphs, the failures, and the disasters associated with the administration of one or other of this already very large group of drugs.

In this year's *Medical Annual*, there is an excellent section on the subject under the title sulphonamine, in which the chemical, pharmacological, experimental, clinical and toxological investigations during the last two years are reviewed, and in many other sections there are references to the therapeutic use of these drugs. They are unquestionably of great therapeutic value in many infections and can be administered to most patients with impunity, but we have still much to learn about their toxicity in individual cases.

Most recent advances in surgery are in the special branches: an exception is the injection treatment for varicose veins. A recent survey of the results of this method of treatment, as compared with ligature, has shown that in Sweden the death rate from pulmonary embolism is 1 in 3,000 against 1 in 400 following ligature: bed-ridden patients are the worst subjects for injection. Regional ileitis seems to be well established as a new disease, and one which lends itself to surgical treatment. In the treatment of the Raynaud group more experience has been gained in sympathectomy and better results are being obtained when the stellate ganglion is preserved. Further advances in chest surgery are recorded.

Typhoid fever seems to be in the news again this year and in England sanitary complacency has been severely shaken by some serious epidemics. The question of the advisability of undertaking inoculation of the population in the event of, and in the presence of, an epidemic has raised considerable discussion during the year, but does not seem to have attracted the attention of the reviewer, who is content to give some details of a report of the effect of inoculation in the Italian army: there is of course no question that wisdom before the event is the best course.

The sections on blood diseases, including anæmia, are most disappointing. In these sections the reviewer has

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persistently interpolated his own views, which in the opinion of many hæmatologists are not always well founded, in a most irritating manner. His outlook is peculiarly insular. In commenting (quite unnecessarily) on Wills' very important experimental work on macrocytic anæmia in monkeys, he says that her fears regarding the limited efficacy of the more purified liver extracts in macrocytic anæmias are unsupported by clinical evidence: the reviewer's own experience being apparently limited to pernicious anæmia, he ignores the other macrocytic anæmias in some of which it has been definitely shown that the 'anahæmin fraction' is not curative, whereas the less refined liver extracts are.

Under Banti's syndrome, a full page—the amount of space devoted to the whole subject of pernicious anæmia, with its vast current literature—is devoted to one paper, admittedly a useful analysis—mainly, we fear, because it happens to support one of the reviewer's particular theories.

We cannot agree with the reactionary views of Professor Davidson regarding monocytic leukæmia. There may be some difficulty in differentiating the individual monoblast and myeloblast, but experienced hæmatologists are usually able to make a diagnosis at the first examination and any possible doubt is dispelled by following the case for a very short time. In the same way, the clinical picture of the two groups present differences, though individually there will be overlapping. Nor can we agree that the distinction is only one of academic interest; the final prognosis may be the same (as Henry Ford says, 'We are *all* on the spot'), but the immediate prognosis is not.

Histidine in the treatment of peptic ulcer which raised some of our hopes to such heights is now decently buried; let us hope that its sad story will at least provide a warning to the experimenter and to the clinician, and possibly material for the psychologist.

Indian readers will be particularly interested in the section of Yoga. A few serious medical studies have been made recently and are well reviewed here.

The publishers have obviously taken considerable trouble not to increase the bulk of the book or decrease the quality of the paper. They have economized by cutting out the illustrations of new instruments. This was we suppose necessary, but we miss them.

There is in some of the sections a little too much 'chat' by the reviewers. With a more ruthless use of the blue pencil many pages could have been saved without loss to anyone (unless the reviewers receive their remuneration by the line). A more frequent change of reviewers would help to maintain the standard; some writers are extremely conscientious but others get careless when they have to do a thing year after year. However, this excellent publication maintains a high standard and is still the best book of its kind in the English language.

L. E. N.

RECENT ADVANCES IN PATHOLOGY.—By G. Hadfield, M.D., F.R.C.P. (Lond.), and L. P. Garrod, M.A., M.D., B.Ch. (Camb.), F.R.C.P. (Lond.). Third Edition. 1938. J. and A. Churchill Limited, London. Pp. xii plus 420, with 65 illustrations. Price, 15s.

We always have the greatest sympathy for the authors of this excellent series, *Recent Advances*. The problem which they have to face in deciding on their method of approach must be a sleep-robbing one. The various authors have solved it in various ways; this fact demonstrates the wisdom of the publishers in not attempting to uniformalize the series except in the matter of title, the general up-to-date-ness of the contents, and the format of the book. Some authors have produced a short up-to-date textbook on their subjects, others a series of barely connected essays.

In the case of the book under review our sympathy with the authors is combined with a great admiration for the skilful way in which (the textbook solution being obviously out of the question) they have avoided the essay method by secreting from each chapter a sufficiency of reticulin to produce enough reticulum (*sensu restricto*) to form the cellular reticulum (in the sense of the authors), a connected if not a homogeneous tissue.

The revision has been considerable and in the authors' words 'little more than half of the previous text is retained'. In some instances the new information available made rewriting of the chapter necessary but in others a ruthless exclusion of useful sections was required to make room for fresh matter, and for this reason, whilst we strongly advise readers to supplement their libraries by the addition of this volume, we also suggest that they retain the previous one.

The new chapter on resistance to infection is an example of masterly compression of a vast subject. That on the reticulo-endothelial system is an old friend which we are glad to see retained: it has however been revised and brought up to date. We do not know any short account that gives a clearer conception of the new knowledge on the ætiology of the anæmias than the section on gastric function and anæmia. Another very important chapter is the one on deficiency diseases; in this there is a very clear account of the specific changes that are brought about by deficiency in the various vitamins: our present knowledge is well summarized and the huge gaps in this knowledge clearly indicated.

The authors have a particularly lucid style, and they have avoided all use of the pathologist's jargon, which makes the book very suitable for the student and the clinician; to the library of the teacher of pathology, it is almost an essential addition. There are numerous photomicrographs of sections of morbid tissues; these are well chosen and excellently reproduced, and show in every instance what they claim to show, which is unusual, even in books of high standing.

A HANDBOOK ON DISEASES OF CHILDREN INCLUDING DIETETICS, WELFARE AND THE COMMON FEVERS.—By B. Williamson, M.D. (Edin.), M.R.C.P. (Lond.). Second Edition. 1936. E. and S. Livingstone, Edinburgh. Pp. xii plus 329. Illustrated. Obtainable from Messrs. Butterworth and Company (India), Limited (Publishers), Calcutta. Price, Rs. 7

In this publication the word *handbook* has regained what surely must have been its original meaning, a small or handy volume that covers the subject completely but concisely. The word, and more particularly its German equivalent *handbuch*, is now applied to any complete treatise, even up to the size of an encyclopædia of twenty volumes, each of which is a severe strain on the wrist when held in the hand.

With its moderate size, round corners, and flexible cover this book is obviously designed, not only to be held comfortably in the hand but to be slipped into the student's pocket; for it is an ideal book for the student and one that the practitioner will find very useful for refreshing his memory.

The various diseases that are common, more pronounced or exhibit special features in childhood, as well as those that are peculiar to this time of life, are dealt with concisely and on the whole adequately. There is practically no reference to tropical diseases, which is certainly a point in favour of the book as the crude attempts to include them made by writers of similar books, who naturally have no first-hand experience, often shakes one's confidence in the book as a whole. On the other hand, the short remarks on malaria in this book are sound; the author lays emphasis on the fact that only benign tertian malaria is likely to be encountered in England and he recommends adequate doses with quinine, in fact 10-grain doses for a child of 10 years might be considered a little high; but he does not mention euquinine with its obvious advantages in the case of children. He has the courage, which few writers have, to refer the reader to the manufacturers' 'folder' for more precise details regarding the dosage of atebrin.

There are a few minor errors that may be attributed to the type setter, for example, the spelling 'acroflavine' on p. 249.

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A TEXTBOOK OF *X*-RAY DIAGNOSIS.—By British Authors. (In three volumes.) Volume I—Edited by S. C. Shanks, M.D., P. Kerley, M.D., M.R.C.P., D.M.R.E., and E. W. Twining, M.R.C.S., L.R.C.P., D.M.R.E. 1938. H. K. Lewis and Company, Limited, London. Pp. xii plus 591, with 398 illustrations. Price, Volume I—50s.

THE need for an authoritative book of reference on *x*-ray diagnosis has been felt by the British physician and surgeon for some time. A number of atlases, small textbooks, and books on special subjects, and many good American books have been published, but they have failed to supply the want to the satisfaction of many readers, who are not unnaturally slightly prejudiced in favour of their own national point of view. This book is therefore particularly welcome.

The editors have attempted to provide within reasonable limits 'a comprehensive survey of the present position of *x*-ray diagnosis'. Diagnostic radiology is becoming an increasingly complex specialty and it is difficult for any one person to be equally expert in all its branches. The editors have therefore sought, and obtained, the collaboration of a number of radiologists and clinicians, experts in their particular branch of the subject, who, if one can judge from the quality of the first volume, have produced an authoritative work which will appeal primarily to the clinician, but also to the pre- and post-graduate student of radiology.

The publishers have been extremely generous in the matter of illustrations and nearly every conceivable condition is illustrated. But the book is by no means an 'atlas', as the subject is dealt with fully in the text and is made comprehensible, even without the illustrations.

There are three parts in this first volume, but of the 578 pages of the text 380 are occupied by the radiology of the respiratory system. The whole subject is very well covered, and in each case the clinical picture and the pathological changes are described and correlated with the radiological findings.

The other two sections are on the cardiovascular system and the urinary system. As the writers quite rightly say, the radiography of the heart, the orthodiagram or the teleradiograph, cannot possibly replace other methods of investigation of the heart, but they may be useful supplementary aids to these other methods.

The editors are to be congratulated on their wise choice of contributors, these on the quality of the contributions, and the publishers on the very high standard of book production they have achieved. The second volume has just been received and will be reviewed in the next number of this *Gazette*. The third has been promised within a few months.

THE INFANT: A HANDBOOK OF MODERN TREATMENT.—By Eric Pritchard, M.A., M.D. (Oxon.), F.R.C.P. (Lond.). 1938. Edward Arnold and Company, London. Pp. xi plus 744. Illustrated. Price, 18s.

THOSE who like the writer have regarded Dr. Pritchard's *Physiological Feeding of Infants and Children* as a sort of bible for the nutrition of children will welcome another volume from one who justly made for himself a reputation as one of the foremost pediatricians of Great Britain. The reader should, however, read the preface carefully in order to understand what the book is. He will then know what to expect of it. It is, as its name denotes, *a handbook of treatment* and not a textbook on children's diseases. For this reason it is a book which will appeal and be useful to the practitioner rather than to the student. The medical man or woman will find in its pages the garnered wisdom of many years of practice, most of which was carried on at the Infants' Hospital, Vincent Square. Many of the methods and ideas are Dr. Pritchard's own and this gives the book a freshness and originality which makes its reading a pleasure. Dr. Pritchard emphasizes that the book is one for reference, but actually it is much more than that and the first chapters especially can be read straight through without the least feeling of lack of continuity. In many ways they are the best in the book perhaps on this account. They deal with the subject of nutrition and deal with it most effectively. Dr. Pritchard speaks with the authority of long experience. His methods are not 'fancy' ones, they are based on common sense as well as theory of nutrition and many fallacies are exploded. Children brought up on Dr. Pritchard's regime are not likely to be starved and they will enjoy their meals without a doubt. The mother also has reason to be thankful to a doctor who avoids being faddy in food matters and who recognizes psychological as well as physiological principles.

The chapter on the new-born and premature infant is another mine of wisdom. After that the systems are dealt with in turn. This portion of the book naturally does not lend itself so easily to continuous reading but the style is never boring and never gives the impression of 'potted' information. It is significant to note that in most cases the treatment for a particular malady is divided into two portions and that the prophylactic treatment is placed first and thoroughly stressed. It will not be wrong to trace this emphasis to Dr. Pritchard's association with welfare centres. He was in charge of the welfare centre at the St. Mary-le-bone Dispensary which was perhaps the first centre in England.

There are two valuable appendices. One contains prescriptions and pharmacological preparations; the other gives the technique of a number of clinical procedures. Both of these will be found most useful to doctors dealing with children.

The book is well got up and the type, though not large, is very clear and easy to read.

R. Y.

EMERGENCY SURGERY.—By H. Bailey, F.R.C.S. (Eng.). Third Edition. 1938. John Wright and Sons Limited, Bristol. Pp. 852, with 816 illustrations. Price, 50s.

THIS book is far too well known to necessitate any detailed description and it already enjoys too high a reputation to make fulsome praise anything but an impertinence. One would prefer to announce the arrival of a third edition and to leave it at that, but in return for the gift of so handsome a volume a little more than this seems to be due.

The first chapter is on intravenous transfusion and the second on blood transfusion. The order is a natural one, but carries a special significance. How often does one hear the plea 'unfortunately I couldn't give a blood transfusion as no donor was available', when the patient's life could quite well have been saved by a saline or other isotonic transfusion? The next two chapters are on anæsthesia and surgical equipment, respectively: for the latter Mr. Hamilton Bailey has reclaimed the word 'armamentarium', so much more suited to the surgeon's use, but by prescriptive right almost the property of the physician. Thence the author has passed on to the specific emergencies with laparotomy rightly occupying the first place.

The author in the preface to the first edition pictured a patient with an urgent surgical condition and an isolated surgeon called in to deal with the situation. 'Should these pages', he writes, 'help the latter to save the former, their main object will be fulfilled'. They undoubtedly have in the past and will in the future, many times over.

We cannot conclude without mentioning the really superb book that the publishers, the well-known publishers of that journal-de-luxe, the *British Journal of Surgery*, have produced.

SURGICAL DISEASES OF THE MOUTH AND JAWS. —By E. C. Padgett, B.S., M.D., F.A.C.S. 1938. W. B. Saunders Co., Philadelphia and London. Pp. 807, with 334 illustrations. Price, 45s.

THE rapid progress of surgery in modern times has led to the development of many of the special branches to a size to which in days gone by general surgery alone could claim. For example, surgical diseases of

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the mouth and jaws can without any undue effort provide sufficient material for a complete volume. Admittedly, three different spheres of influence are involved in this subject; general surgery, dentistry and rhino-laryngology are all equally interested. In writing this book the author has approached the subject from the standpoint of broad surgical principles, and general pathology. An attempt has also been made to cover the report of the Curriculum Committee of the American Association of Dental Schools, made in 1935.

This book of 807 pages of printed matter consists of 42 chapters. The preliminary chapters deal with the method of examination, surgical regional anatomy, principles of asepsis, and management of injuries to the soft and hard tissues. The fractures of the upper and lower jaws are discussed in some detail with clear descriptions of necessary dental splints and contrivances. Incidentally, these chapters cover a great deal of dental surgery. Regarding the treatment of facial erysipelas and cellulitis, there is a short reference to prontosil without adequate details of its dosage and modes of administration. There are two chapters dealing with acute and chronic inflammations of the pharyngeal and buccal cavities. To the neuralgias of this region one chapter has been assigned which could have been further amplified. The correction of mandibular prognathism has been carefully described and the plastic operations on the face, including hare-lip and cleft palate, are clearly set out. There are several chapters on benign and malignant tumours for which the requisite operative procedures and the methods of irradiation have been clearly described. The following chapters deal with surgical and prosthetic restoration of deformities, and the important subject of anæsthesia finds a place in the last chapter.

In conclusion, we would like to congratulate the author on a noteworthy contribution to the literature of oral surgery. We have no doubt that he has succeeded in producing a volume which would be found useful to both the general and the dental surgeon. It would also be of interest to the 'nose and throat' specialist, the dermatologist, the radiologist, and the post-graduate student. This is no small praise for a book on special surgery. The printing and illustrations are excellent and there is a useful index.

P. N. R.

SURGICAL ANATOMY OF THE HEAD AND NECK.—By J. F. Barnhill, M.D., F.A.C.S., LL.D. 1937. Baillière, Tindall and Cox, London. Pp. xiv plus 922, with 431 illustrations, many in colour. Price, 90s.

IN an appreciative introduction, Dr. McKibben, Professor of Anatomy in the School of Medicine, University of Southern California, says that 'Professor Barnhill has for many years been a good and successful surgeon. His teaching has made a great contribution to the practice of otolaryngology throughout the country'. In the preface, we have the statement of the author that 'his teaching has amounted to a sort of anatomical clinic'. From the beginning it was evident to him that the most efficient post-graduate teaching could be done only 'when each student was required to do his own dissecting and prepare his own specimens'.

This is a book of considerable size, consisting as it does of over 900 pages and 431 illustrations and 35 chapters or, as the author prefers to call them, 'periods'. Each 'period' deals with a part of the regional anatomy of the head and neck together with pertinent applied anatomy and physiology. Illustrations are copious, but as they are near the end of the book, far away from the text, constant reference becomes irksome. We are sorry to note that there are several statements to which exception may be taken, *e.g.*, 'boils and carbuncles originate in the sebaceous glands as a result of staphylococcal infection!' (p. 1). About the 'carotid sinus' the author is of opinion that 'the bulging carotid of the bifurcation, the sympathetic nerves which form a plexus upon it and the carotid body all are parts'; this is a sentence carrying little meaning to the uninformed (p. 33). Regarding the surgical removal of the mixed parotid tumour, the author recommends 'an antero-posterior incision over the gland' (p. 450). We take it that the incision is meant to be parallel to the branches of the facial nerve. Further, the author's statement that 'after general anæsthesia, in some instances, nephritis is attributed to the anæsthetic, especially to ether', is open to serious objection. The use, according to the author, of a local anæsthetic 'often simplifies the operation, the whole procedure seems less formidable under local' (p. 398). Such loose statements are hardly justifiable in a work which is intended for post-graduates. The names of many authorities have been quoted but no references are given.

It is apparent that this book is the work of an experienced teacher and that the underlying principles are sound and practical. For post-graduate studies it is necessary to presume that the ground-work has been prepared, otherwise constant repetition and inclusion of obvious and elementary matters would increase the bulk of the book and consequently its price which is not an insignificant matter at the present time. The illustrations are, on the whole, very good and the language, though didactic, is easily readable. The fact that the book has been printed by subscription shows that there are a large number of people who appreciate the author and his past work. We hope that this book, in spite of its shortcomings which may be easily remedied, will be found useful not merely to specialists dealing with the head and neck, but also to the general practitioner. The printing and binding are both very good and there is a useful index.

P. N. R.

A SHORT TEXTBOOK OF SURGERY.—By C. F. W. Illingworth, M.D., F.R.C.S.Ed. 1938. J. and A. Churchill, Limited, London. Pp. viii plus 702, with 8 plates and 179 text-figures. Price, 21s.

THERE are many who are inclined to deny the utility of abbreviated textbooks of surgery because they are related to the so-called 'catechisms and aids'. There is, unfortunately, no short cut to success in the mastery of surgery. Obviously, therefore, the author of *A Short Textbook of Surgery* has attempted, by his novel nomenclature, to avoid the indignity of being included in the category mentioned above. It has to be admitted that surgery has attained unwieldy proportions, but that is no excuse for the encouragement of cramming.

This short textbook of surgery, consisting of 702 pages, belies at the very outset its name. In the preface, the author states that he has endeavoured to mould his book in a form suitable for under-graduate and post-graduate students, and to make it comprehensive while keeping within the bounds of a single volume. Such an endeavour is beset with many snares; for instance, for the treatment of tuberculous sinus we are instructed to expose the sinus to regular doses of ultra-violet light. What are these 'regular doses' and is it really possible, we ask, to expose a tortuous and deep-seated sinus to regular doses of ultra-violet light? There is a brief paragraph on filarial elephantiasis, wherein it is stated that 'this condition arises in persons infected with the *filaria sanguinis hominis* and is due to lymphangitis caused by the irritation of parasites present in the lymph vessels. It is common in tropical Africa'. This book, obviously, is not intended for the Indian student who has a closer acquaintance with the *Wuchereria bancrofti*.

Dealing with fractures of the clavicle, Sayre's archaic method is honoured with two excellent illustrations depicting a form of barbarity about which the hairy male and the female with well-formed breasts would have much to say. For the treatment of gastric and duodenal ulcer, a dietary regime such as Sippy's is recommended, but it is nowhere mentioned what Sippy's treatment consists of. Yet, in order to exclude nothing perhaps for the doubtful benefit of the post-graduate student, there is a paragraph on simple tumours of the small intestine. We have noted with some surprise

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that for appendicectomy the grid-iron and Battle's incisions are still recommended, while the paramedian incision is reserved only for the pelvic appendix. The brief reference to amœbic liver abscess is totally inadequate for the Indian student. We regret very much that we are unable to recommend this handsome well-printed book to the student of surgery in this country.

P. N. R.

TEXTBOOK OF EXPERIMENTAL SURGERY.—By J. Markowitz, M.B. (Tor.), Ph.D., M.S. in Exp. Surg. (Minn.). 1937. Baillière, Tindall and Cox, London. Pp. xvi plus 528 and 330 figures. Price, 31s. 6d.

IT does not take the reader long to discover that this is a book of considerable merit. In an interesting foreword, Dr. D. C. Balfour writes, with some truth, that 'of all factors contributing to the remarkable advances which have been made in surgery during the past fifty years, none has been of greater importance than the influence of laboratory experimentation'. This is a book of convenient size, although it consists of 528 pages, and, as may be expected, it makes in places difficult reading, in spite of a generous display of effective illustrations. The pressing surgical problems of the day have been subjected to experiments on animals with varying degrees of success. It was once believed that pulmonary complications after inhalation anæsthesia were due to aspiration from the mouth, but further experience shows that these are just as common after spinal anæsthesia, suggesting thereby that infective emboli may play an important part. In the somewhat arid and technical chapter on operating-room equipment, the author has unexpectedly burst into rhyme to lament the prevalent ignorance of physiological facts:

'Why does the donkey bray, papa,
Why does the donkey bray?'
'The reason for the donkey's bray,
Is that the beast was born that way'.

We are afraid that such incongruous levity does not really lead to 'brighter surgery', if that was the author's intention.

It is claimed that the difficulties of aseptic intestinal anastomosis have been overcome by the 'basting stitch' method which is clearly explained with diagrams. The artificial production of chronic peptic ulcer in the dog cannot yet be said to have reached the stage of finality. It appears that in addition to the chemical factor of defective neutralization of ejected gastric juice, there are also certain mechanical factors, of which the rôle of trauma is yet to be determined. The problem of peritonitis is no nearer solution. It is also claimed, however, that, by the intra-peritoneal injection of a mixed vaccine, immunity against post-operative infection can be achieved in a large measure. The mutilating experiments on the pancreas, liver and the biliary apparatus have been continued without achievement of any appreciable success. The pathology of obscure bone diseases is now being investigated with the help of animal experiments. It is further claimed that by the section of the *ligamentum teres* of the femoral head, Perthes' disease of the hip is produced in the young rabbit. One is left incredulous with such an assertion, for what is true of the young rabbit need not necessarily be true of the human child. There is no evidence that in the latter the vascular supply of the femoral head is dependent on the vessels transmitted by this ligament. Within the domain of neuro-surgery, the involuntary nervous system is destined to see some major developments in the near future. There is good reason to believe that substances almost, if not quite, identical with adrenalin and acetyl-choline are liberated when the sympathetic and parasympathetic respectively are stimulated. It is reported that Professor von Lichtenberg is treating chronic pyelo-nephritis successfully by denervation of the renal pedicle. The modern surgeon cannot afford to ignore the so-called 'James-Lange theory' of emotions which postulates that an emotion is a visceral change of which the organism becomes aware. Herein we find another intimate meeting-ground between surgery and physiology. The chapters on blood vessels and trans-plantation of the viscera present new possibilities in surgery, but we need not here go into details.

In an epilogue the author expresses the hope that this book may become a contribution to the teaching of surgery. W. G. Mayo has rightly remarked that in medicine, understanding must precede belief. The work of John Hunter is not yet completed; animal experiments alone will not succeed without a Lister behind them. Circumscribed though it is by obvious limitations, experimental surgery has its possibilities. This book may, therefore, be regarded as a primer for those who aspire to tread this difficult path.

One final word of caution is needed. An effective answer has not yet been made to the protests of animal lovers. The Anti-Vivisection Society of England points out that in the year 1936, 822,167 experiments were performed on living animals in that country, and 27,402 animals were allowed to recover consciousness after the operation and were kept alive. These are cold statements of fact but what they imply in the infliction of needless suffering on helpless animals is almost incalculable. We have no access to American statistics which, there is no reason to doubt, must be at least proportionately larger. Notwithstanding the scientific basis of this book, instances of needless cruelty to dogs are not difficult to find. Animal lovers may claim with justifiable indignation that there is a clear case for more vigilant control over animal experiments.

P. N. R.

LIPPINCOTT'S QUICK REFERENCE BOOK FOR MEDICINE AND SURGERY: A CLINICAL, DIAGNOSTIC AND THERAPEUTIC DIGEST OF GENERAL MEDICINE, SURGERY AND THE SPECIALTIES, CULLED EXTENSIVELY AND INTENSIVELY FROM MODERN LITERATURE, AND SYSTEMATIZED.—By G. E. Rehberger, A.B., M.D. Tenth Edition. 1937. J. B. Lippincott Company, Philadelphia and London. Pp. viii plus 1354. Illustrated. Price, 65s. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 48-12

'THIS book consists of eleven parts, dealing respectively with (1) general medicine and surgery, including neurology and the diseases of infancy and childhood; (2) gynæcology; (3) genito-urinary diseases; (4) obstetrics; (5) skin diseases; (6) diseases of the eye; (7) diseases of the ear; (8) diseases of the nose; (9) diseases of the throat; (10) orthopædics, including fractures and dislocations; and (11) drugs, the whole field, indeed, of practical medicine, excepting psychiatry.

Each disease or disorder is treated alphabetically. First is given a distinguishing, or diagnostic, definition, or description, of the affection, with pictures wherever these are useful. Diagnostic laboratory tests are supplied where required. Next comes a full enumeration of the causes of the disease; then its prognosis, or its expected duration and final outcome. Finally, treatment is given as concisely, explicitly and completely as possible (except, as a rule, for operative technique) so as to obviate the necessity for referring to other works for technique, dosage of drugs, formulæ, etc. In addition quarantine and prophylactic measures are considered where indicated.'

Part eleven contains an alphabetical list of all the drugs mentioned in the body of the work, with the nature, or constitution, of each drug; its solubility; the dosage at different ages; mode of administration; pharmacological action, and toxic effects.

An outstanding feature of this publication is the numerous coloured illustrations, particularly those depicting skin diseases.

In this edition very thorough revision has been effected in, we are informed, almost every section. If we may make a critical suggestion for the next edition, it is that rewriting of the sections rather than patching

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up is indicated, for example, though we have no copy of the first, the 1920, edition to confirm our suspicions, we suspect that much of the original section on pernicious anæmia has been preserved, so that the reference to the really important parenteral liver therapy, which is of course there all right, is difficult to find. There is a reference to Greenspon's (unconfirmed) work, which has no direct bearing on treatment. The hypochromic anæmias are dealt with under the heading 'chlorosis' and the old prescriptions containing inadequate amounts of iron are retained.

A new departure is a very serviceable and very attractive green binding in the place of the old rather-drab red case.

PRACTICAL BACTERIOLOGY, HÆMATOLOGY AND ANIMAL PARASITOLOGY.—By E. R. Stitt, M.D., Sc.D., LL.D., P. W. Clough, M.D., and M. C. Clough, M.D. Ninth Edition. 1938. H. K. Lewis and Company, Limited, London. Pp. xiii plus 961. Illustrated. Price, 30s.

JUST twenty years ago the reviewer became possessed of the fourth edition of this remarkable book. In this there was a total of 497 pages, including the index. The ninth edition contains 961 pages, very nearly twice the size, but the book still remains a masterpiece of the art of condensation of facts, and the increase has been necessitated by the great additions to our knowledge and the application of so many new clinical tests to the investigation of disease in the last two decades, all of which had to be included.

It is of course impossible for such a comprehensive book to be quite up to date and free from error but when one considers the immense amount of information given the omissions and errors noted were very few and only in quite unimportant subjects, as in the life history of *Gnathostoma spinigerum* for example, a rare helminth infection in eastern countries.

If there is any criticism to offer it is that the practice of condensation has been extended to the illustrations so that many of them, particularly in the helminthological and entomological sections, are so small, that they are of little use as no detailed diagnostic characters are discernible, also many of the figures have too many illustrations crowded into a small space.

Notwithstanding the many changes that have been made in successive editions this book still remains, in our opinion, the best general book available for reference on all matters of laboratory technique for the isolated worker, especially in the tropics.

P. A. M.

POULSSON'S TEXTBOOK OF PHARMACOLOGY AND THERAPEUTICS. Second English Edition. By S. Alstead, M.D. (Liverpool), M.R.C.P. (Lond.). 1938. William Heinemann (Medical Books), Limited, London. Pp. xi plus 557. Illustrated. Price, 25s.

THE progress of pharmacology since the publication of the last edition has necessitated rewriting of certain portions and modifying a few others to incorporate all the recent advances in the knowledge of the mode of action of drugs. The present volume is based on the *British Pharmacopœia* (1932) and its *Addendum* (1936) as well as the *United States Pharmacopœia IX* (1936).

The author has collected a large amount of material and has shown excellent discrimination in the comparative emphasis laid on various subjects. Adequate attention has been paid to the description of pharmacological action to enable the reader to appreciate the rational basis of therapeutics. The therapeutic uses included in this book are such as serve to illustrate the pharmacological principle but in no sense it is a book on therapeutics, an art which can only be dealt with properly at the bedside.

The first section of the book deals with organic remedies acting after absorption and to the second section belong numerous other organic remedies that act locally. Such a grouping is not always scientific and although the author claims that the drugs belonging to the first section have as a rule a local action which is insignificant, the inclusion of the cocaine series in this section does not appear a happy one.

The third section deals with the salts of light metals, alkalis, acids, and halogens, and the heavy metals and metaloids are dealt with in the fourth section. The last two sections deal with ferments and foodstuffs, and the anti-toxin and bacterial products. These agents play a very important part in modern therapeutics and a thorough study of them as in the case of other sections would have been welcome. Apart from this, the description of the various drugs is exemplary. Details of a large number of new remedies have been included and the dosage is given in both the English and the metric systems.

This is a valuable book, containing a vast amount of information which has been compiled with considerable care. It will repay perusal by any medical man and will prove a useful reference volume to every practitioner. It is written in an easy and lucid style, and deserves the popularity it enjoys in many countries.

R. N. C.

OCCUPATIONAL TREATMENT OF MENTAL ILLNESS.—By J. Ivison Russell, M.B., Ch.B., F.R.F.P.S. (Glas.), D.P.M. 1938. Baillière, Tindall and Cox, London. Pp. xvi plus 231, with 41 illustrations including 6 plates. Price, 6s.

As the author states in the preface, this book is primarily concerned with the needs of the mental hospital nurse. Nevertheless, it is a book which almost any member of the staff of a mental hospital could read with benefit. A large variety of occupations suitable for the treatment of mental patients are described fully and, whenever necessary, the description is supported by diagrams. The author seems to think that occupational therapy involves the segregation of the sexes. No useful purpose is served by such procedure. Further, female patients sometimes work better and more cheerfully at occupations usually allotted to men, and *vice versa*. No mention is made of an occupation which frequently elicits great pleasure in some patients, namely, the care of birds and animals. Sericulture is another occupation which some patients find greatly to their taste. The old-fashioned printing press affords a particularly suitable type of occupation to patients of both sexes but this form of therapy is not included by the author. The author has some excellent advice to give on the disposal of manufactured articles, a problem with which most mental hospitals have to contend. Taken as a whole this is a most valuable book which should find a place in the occupational therapeutic department of every hospital.

O. B-H.

APPROVED LABORATORY TECHNIC. CLINICAL, PATHOLOGICAL, BACTERIOLOGICAL, MYCOLOGICAL, PARASITOLOGICAL, SEROLOGICAL, BIOCHEMICAL AND HISTOLOGICAL.—By J. A. Kolmer, M.D., Dr.P.H., Sc.D., LL.D., L.H.D., F.A.C.P., and F. Boerner, V.M.D. Second Edition. 1938. D. Appleton-Century Company, London and New York. Pp. xxvii plus 893, with 12 plates and 380 illustrations in the text. Price, 30s.

SCIENCE is measurement. It is therefore very essential that all the instruments used should be conformed to a single standard. Such a standardization is possible to achieve. It is also essential that the users of the instruments should conform to certain standards, but here, as one is dealing with the human factor, standardization is not so easily achieved. If laboratory medicine is to establish its claim to be a science, even if the human factor cannot be eliminated, at least methods should be standardized. To achieve this object a committee was formed by the American Society of Clinical Pathologists to select the methods most suitable for general use and least likely to introduce errors and variations in results. The first edition of this book was the result of their labours in this direction.

There were five main section headings—General Laboratory Methods, Clinical Pathological Methods,

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Bacteriological Methods, Serological Methods, and Chemical Methods. From this it will be seen that the project was an ambitious one. It was also a successful one, and the book was accepted as a final court of appeal on points of technique, with the authority of the Society behind it. The second edition does not appear to be published under the direct auspices of the Society of Clinical Pathologists, but of a body of 28 collaborators. The original edition has been thoroughly revised, chapter by chapter, and five new chapters have been added.

A single method is usually described, but occasionally an alternative method is given. The descriptions are clear and, as far as we can judge, the methods chosen are the best ones for most circumstances, if not for all; the employment of expensive apparatus disqualifies, for general use in this country, some of the methods described.

We have a few criticisms. Co-ordination has not been complete—for example, in the chapter on methods of examination of the blood there is a section on 'methods for laboratory diagnosis of kala-azar' which is short but adequate. In a later chapter on 'diagnostic bacteriologic methods' there is also a section on 'laboratory diagnosis of kala-azar' which is misleading and quite useless. This incidentally is preceded by a section on the diagnosis of granuloma inguinale in which the causative organism is described as 'small oval bodies' resembling the 'Donovan bodies of kala-azar'; there is some confusion here.

The methods described for the examination of fæces for protozoa and helminths are all sound, and one's confidence in the writers is raised when one finds that they do not attempt to give false criteria for the differentiation between the ova of *Tænia saginata* and *T. solium*, or of *Ancylostoma duodenale* and *Necator americanus*, respectively, but it is surely a little confusing to describe *Diphyllobothrium latum* in the text, and give an illustration of the ovum of *Dibothryocephalus latus*.

This new edition is quite up to the high standard of its predecessor and we can thoroughly recommend it as a standard reference book for the laboratory. When funds are limited, the wide scope of this book makes it the book of choice for this purpose.

L. E. N.

ESSENTIALS OF PSYCHIATRY.—By G. W. Henry. Third Edition. 1938. Baillière, Tindall and Cox, London. Pp. xii plus 465. Price, 22s. 6d.

NOT only to doctors but to nurses and students, Dr. Henry's *Essentials of Psychiatry* must by now be a well-known book. This third edition is well up to date and contains a good deal of new matter. There is an excellent chapter on psychiatry in the general hospital, a feature of medical practice not yet thought of in this country. The chapter on psychiatric nursing also repays careful study. In the chapter devoted to treatment, no mention is made of medicinal treatment or of the new 'shock' treatment through the administration of insulin or cardiazol. Although neither of these forms of therapy is yet fully established, the interest they have aroused among psychiatrists the world over would seem to warrant notice in a book of this description.

O. B-H.

CHEMISTRY OF THE BRAIN.—By Irvine H. Page, A.B. (Chem.), M.D. 1937. Baillière, Tindall and Cox, London. Pp. xvii plus 444. Price, 34s.

THE strangeness of the name of this book is gradually explained as the reader goes through the introductory chapter. The book appears to be a real approach, on scientific and methodical lines, in the field of chemical investigation into the hitherto uninvestigated diseases of the brain, including nervous and mental diseases.

It cannot be denied that very little work in the way of finding out the exact chemical constitution of the brain has been done. The author is of opinion that the economic liability of nervous and mental diseases is, in a social sense, so vast that much more interest should be taken by the medical profession as a whole to solve some of these uninvestigated problems.

The value of this statement becomes quite apparent when one thinks that in the United States alone more than half a million persons live in institutions for nervous and mental diseases.

In the present volume the author has laid great stress on the rôle of lipoids, firstly, because the brain is composed largely of these substances and, secondly, because the chemistry and metabolism of these substances are little understood, the literature on the subject being comparatively meagre.

The author has taken great pains to make a search for the thoughts and efforts of previous investigators upon the subject and has laid down in this volume a commendable summary of the work done previously on the subject. He has brought together data which are widely scattered in the literature in as orderly a fashion as is possible.

The perusal of the book should carry conviction to the reader that the author's attempt to remove this important subject of the metabolism of the brain from the realm of speculation to one of reality by scientific experiments and reasoning is a real advance in the right direction and merits praise and commendation.

J. P. B.

AIDS TO BIOCHEMISTRY.—By E. H. Cooper, D.Sc. (Lond.), F.I.C., A.R.C.S. (Lond.), and S. D. Nicholas, B.A. (Oxon.), A.I.C. Second Edition. 1938. Baillière, Tindall and Cox, London. Pp. viii plus 213. Price, 43s. 6d.

IN this little book the author has dealt with both theoretical and practical consideration and practical experiments in biochemistry and has put them in a clear and simple way. It is intended primarily for students not only for purposes of revision but also as a sort of a laboratory guide.

The first edition of this book was published over 10 years ago and, owing to the vast progress of biochemistry during the period, a large section of the book had to be rewritten in order to bring the contents up to date. Two additional chapters on hormones and hydrogen-ion concentrations have been included and the chapters on carbohydrates and vitamins have been extended.

The book will be found useful to students of biochemistry not only as a manual for revision for purposes of examination but also as a laboratory guide for experimental work.

J. P. B.

OCCIDENTAL THERAPEUTICS IN THE NETHERLANDS EAST INDIES DURING THREE CENTURIES OF NETHERLANDS SETTLEMENT. (1600—1900.)—By Dr. D. Schoute. 1937. Published by the Netherlands Indian Public Health Service, Batavia. Pp. iv plus 214

DR. SCHOUTE recently undertook to supply 'a concise summary in a universal language' of the material from his two previous publications on the history of medicine in the Netherlands East Indies.

In his preface to his book, Dr. de Langen refers to the classical remark of the French Field-Marshall, Lyautey, 'La seule excuse de la colonisation c'est le médecin'. To this remark coming as it does, not from a doctor but from a soldier, colonizer, and administrator, we draw the attention of the foreign administrators in this country. Even if it were possible—and we do not believe that it is—to achieve anything but a spurious semblance of material prosperity amongst a disease-ridden population, real prosperity can only be enjoyed to the full by healthy, and therefore happy, people.

The account given covers a period of three hundred years from the days of the earliest Dutch colonists in 1600 to the end of last century. Records covering the early years are few and the writer has drawn on captains' logs and other records connected with shipping. These tell an alarming story: if the ship completed its

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journey at all—which it often failed to do being lost with all hands—the average death rate on board during the voyage between Amsterdam and Batavia was 8 per cent and was occasionally as high as 40 per cent of the personnel—but it must be remembered that the voyage took anything up to 400 days, a striking contrast to the present-day 130-hour trip which the K. L. M. air-liners make in each direction three times a week.

The Dutch administration was interrupted at the beginning of last century by European wars and for five years no ship arrived in Java from the Netherlands. From 1807 to 1811 they enjoyed the not very sympathetic rule, to medical science at any rate, of a military-minded French governor Daendels; he was turned out by the British Raffles, who remained for about five years. The latter's influence on medicine and science generally appears to have been good, and he remodelled the medical services on the Bengal lines. He was followed by Sir John Fendall. These two British administrators appear to have remained in Java for all this time because nobody told them not to, and when at last they had given up all hope of persuading the British Government to declare the country a British possession, they gracefully handed it back to the Netherlands.

The references to individual diseases are few, but in the section on cholera there is a record of some incredible decisions at which a body of Batavian physicians, who were called together to deal with a severe cholera 'epidemy' in 1851, arrived. These commenced with the statement that the disease was not infectious—in the widest sense of the word—and that, as no means to ward off cholera were known to be successful, none should be attempted!

Medical progress was slow, as it was in all colonies, and lagged behind that in the European mother country, but an evolutionary movement was apparent at all times throughout the last century.

The record is one of great medical as well as historical importance, and we congratulate the author on his achievement. The English is excellent throughout except that he uses a few unusual words, such as 'epidemy', and the reader in this country will take a little time to get accustomed to the words 'India' and 'East India Company', used, as they are throughout, to indicate the Netherlands East Indies and the United Netherlands East India Company, respectively.

L. E. N.

THE DIARY OF A SURGEON IN THE YEAR 1751-1752.—By John Knyveton. Edited and Transcribed by E. Gray. 1938. Published by D. Appleton-Century Company, Inc., London and New York. Pp. xiv plus 322. Illustrated. Price, 10s. 6d.

THE reviewer was not aware that he had a suspicious nature but there are a few points about this book that invite scepticism. We have singularly little information about the 'journal' itself. Was it written in English? The 'journal', as it now appears, is not written in the English of 1751—the word 'prosy' was, according to the S. O. E. D., used first in 1821, seventy years later—nor incidentally in the English of to-day. In fact the style is like that of Pepys' Diary, which was written three-quarters of a century before, and deciphered three-quarters of a century after, the date of the John Knyveton's diary. We might also add that the literary style is not that of Ernest Gray, of the preface; this, like his grammar and arithmetic, is unique. Never have we known any writer to take such liberties with the participle!

'This George Knyveton was a distant ancestor of a very close friend of the editor, the leather-bound Journal in which the Diary is written appearing whilst helping this friend sort out some old family records, and being presented to him, as one especially interested in the History of Medicine'.

'Bearing all these things in mind, the hospital of those days can better be imagined than described'.

'Physicians and surgeons as a whole were growing tired of the dogmatism of the ancient authorities—Aristotle, Hippocrates, and Galen, whose theories had held sway for some five hundred years'.

Why only five hundred years? This might have been a misprint, but it is not so, for the writer is quite determined to stand by his 'five hundred years'.

'Galen died in A.D. 200, but his view that the body was composed of certain "Humours" (originally four in number), disease resulting from absence or over-production of one special "Humour", dominated the medical outlook, as we have said, for five hundred years'.

Why was it necessary to disguise the name of the hospital or even of the surgeon? (Incidentally the name of the hospital is very thinly disguised: from Soho Square to which hospital does one walk 'across the park' and thence along the Mall to Westminster Abbey?)

However, this is all by the way. The diary itself is full of good things and we can thoroughly recommend it to any one who wishes to learn something of the state of medicine two hundred years ago. The philosophy and humour exhibited making the reading very pleasant; for example, the diarist's observation that one of the differences between town and country practice was that in the former more saw-dust was thrown on the floor of the operating theatre is, we feel, too good to be true: so also are his remarks on the value of the natural acids of certain fruits in the prevention and cure of scurvy.

We can recommend this book to the physician, especially if he is interested in literary detective work as he will find this book a simple exercise, and to his patient, especially the patient who is critical of the medical profession of to-day as he will soon learn to be thankful that he was not born two hundred years earlier.

L. E. N.

IDEAL WEIGHT: A PRACTICAL HANDBOOK FOR PATIENTS.—By W. F. Christie, M.D. 1938. William Heinemann (Medical Books), Limited, London. Pp. x plus 111. Price, 5s.

THERE are many books on diet written for the laity, but it is sometimes difficult for the physician to find one that is altogether suitable to recommend to his patients. So many of these books contain fantastic statements and uphold unorthodox theories to which the physician feels he cannot subscribe. On the other hand, it is usually advisable to recommend to the patient whom he is putting on to a reducing diet some book in which he can look up essential facts. This particular book contains no wild theories about the mixing of proteins, fats and carbohydrates, nor does it suggest the eating of nothing but milk and potatoes one day and avoiding these substances for all the rest of the week: in fact he advocates no particular 'stunt', but gives a plain straightforward statement of a number of important facts regarding the requirements of the body and the composition of foods, which are in the main accurate. We say in the main because a few of the statements are not strictly accurate, for example, that the caloric value of clear chicken soup is *nil*, or that the chemical composition of the vitamins is quite unknown.

The book is written in 'popular' language and any technical words that are used are explained.

The book on the whole will be a very useful one to the physician and his patient.

L. E. N.

DISEASE AND THE MAN.—By R. F. Lapham, A.B., M.D. 1937. Oxford University Press, London and New York. Pp. viii plus 143. Price, 8s. 6d. Obtainable from Oxford University Press, Bombay and Calcutta

THIS book is written to emphasize the importance of treating the individual patient as well as his disease, a thing that is liable to be neglected in these days of improved scientific investigation of patients by

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laboratory experts in that more rational treatment may be recommended to the physician in charge of the case.

Although written from the American standpoint it will be found useful to young practitioners of every country because it mainly discusses human nature, a thing that is essentially the same in all peoples of the world.

ILLNESS: ITS STORY AND SOME COMMON SYMPTOMS. A GUIDE FOR THE LAYMAN.—By S. H. Belfrage, M.D. (Lond.). 1938. Oxford University Press, London, Humphrey Milford. Pp. 173. Price, 3s. 6d. Obtainable from the Oxford University Press, Bombay and Calcutta

IN the foreword the object of this small book is stated to be to give instruction to the lay public so that they will obtain medical advice at an early stage of disease and thus benefit by early treatment.

This object is laudable but the method of presenting the subject is not likely to attain it. The thirty pages of part one are devoted to a general discussion on elementary health principles, and part two, which covers over 130 pages, is headed 'some common symptoms'. This section is not likely to be of much use to the layman for it is probable that long before he has developed many of the syndromes described under this heading he will have consulted a doctor.

Then many of the conditions described are not *symptoms* but short outlines of the pathology and course of *diseases*. Treatment is touched upon and the reader is informed what the doctor should do when he is called in, this seems unnecessary and will perhaps cause embarrassment and disagreement between the doctor and patient if the doctor who is consulted has other views than those given in the book.

A further objection to the book is that it is very carelessly written; for example, 'Also, if there is decay of the teeth or a septic condition of the gums, as in pyorrhœa.', is a typical 'sentence'.

FESTSCHRIFT. BERNHARD NOCHT. VON SCINEN FREUNDEN UND SCHULERN. 1937. Kommissionsverlag Friederichsen de Gruyter and Company, Hamburg. Pp. 704. Illustrated.

THIS volume, produced to celebrate the 80th birthday of Bernhard Nocht, is composed of 116 contributions on every aspect of tropical medicine by as many authors, all of whom are well known in the world of tropical medicine and who represent every important country of the world. It is artistically bound in rough cloth and is a fitting tribute to one of the leaders of modern thought in tropical medicine and a very pleasing way of recording the world-wide appreciation of this great worker's contributions to medical knowledge. The frontispiece is a beautifully reproduced photograph of Nocht himself and depicts him as a rugged kindly old man. It is a book that every worker in tropical medicine should be proud to place on the shelves of his library.

P. A. M.

MEDICAL RESEARCH COUNCIL: SPECIAL REPORT SERIES NO. 227. 'EPIDEMICS IN SCHOOLS: AN ANALYSIS OF THE DATA COLLECTED DURING THE FIRST FIVE YEARS OF A STATISTICAL INQUIRY'.—By The School Epidemics Committee. 1938. Published by His Majesty's Stationery Office, London. Pp. 289. Illustrated. Price, 4s. 6d.

'THIS Report contains the interim report of a committee appointed by the Council seven years ago to investigate the subject of epidemic and other illness in schools from both scientific and practical standpoints.

The study of disease as a phenomenon affecting any individual has been a principal object of scientific effort for thousands of years, and the methods of investigation have reached a high level of precision. The study of the communal or mass factors of disease is also ancient, but although results of great importance have been obtained there is much less knowledge of this aspect of medical science than of disease in its relation to the individual. The accurate description of demographic factors of ill health is hardly a century old in this country, and the experimental study of disease as a mass phenomenon has been in progress for only a few years'.

The Medical Research Council decided that the British Public School provided an excellent opportunity to study epidemic disease in semi-isolated communities and therefore appointed 'a committee, the members of which had expert knowledge of different aspects of the subject, and the active co-operation of the authorities and staff of a representative sample of public schools was fortunately secured'.

'As in all new undertakings, many difficulties—some foreseen, others unexpected—had to be overcome. Yet, despite these, the preliminary results relating to purely practical issues of illness in boarding schools are of important value. Some examples may be quoted. The Committee found that at the beginning of their inquiry about half of the children in the school population under survey had had their tonsils removed, and that this proportion increased through the years of observation by more than six per cent. As they say, 'it was obviously important, in the public interest, to discover if possible whether this mass attack upon one of the normal structures of the body was justified'. The conclusion reached is that its justification is doubtful. Actually the incidence of naso-pharyngeal infections such as influenza, colds, and sore throats, upon boys and girls with or without tonsils did not differ. It is indeed noted that in a group of 384 boys whose tonsils were removed during school life, the sickness experienced before such removal was worse, and after removal about the same, as that of the population as a whole. This shows, what expert clinical experience supports, that *in selected cases* the operation is of value; but it is far from justifying a ritual now practised upon more than 50 per cent of the children admitted to schools of this class.

'This report for the first time provides the general reader with an account, based upon an adequate sample, of the *kind* of information which schools can give, and enables him to judge what contributions to knowledge of hygiene and general epidemiology may reasonably be expected from this source'. The report will naturally be read with great interest by sanitarians, but we also commend it to school medical officers, and head masters and mistresses of schools.

MEDICAL RESEARCH COUNCIL: SPECIAL REPORT SERIES, NO. 228. 'A STUDY OF EPIDEMIC INFLUENZA: WITH SPECIAL REFERENCE TO THE 1936-37 EPIDEMIC'.—By C. H. Stuart-Harris, C. H. Andrewes and W. Smith with D. K. M. Chalmers, E. G. H. Cowen and D. L. Hughes. 1938. Published by His Majesty's Stationery Office, London. Pp. 151. Illustrated. Price, 2s. 6d.

ADVANCE in the study of influenza was held up for a long time by the absence of a suitable experimental animal. This has now been found, in the ferret. Thus, an absolute means of determining whether an attack is influenza or some other respiratory affection is available.

'It is clear that a means of differentiating epidemic influenza from febrile catarrh by clinical examination only, and independently of determining the presence or absence of the influenza virus, would constitute an important advance in the study of these problems. Among other differences, Dr. Stuart-Harris found that whereas the onset of epidemic influenza is usually sudden, in febrile catarrh it is often insidious; that in influenza constitutional symptoms predominate, while in febrile catarrh respiratory symptoms are most common; that the cough in influenza is short and dry, while in febrile catarrh it is more often paroxysmal, irritating, painful and productive. While such differences allow

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fairly good means of diagnosis in the case of groups of patients, they are by no means as certain in the diagnosis of the condition in individual patients. So, although these combined clinical and laboratory investigations have clarified the problem to be solved, they cannot yet be regarded as having provided the medical practitioner with a certain method of differential diagnosis by clinical examination alone. The distinction between the two conditions will obviously acquire great practical importance if a means of dealing with one of them should be found, of such a kind that it is inapplicable to the other. A method based on specific immunity to the influenza virus cannot be expected to have any useful action against different organisms'.

This and other important investigations on influenza undertaken by the authors are reported here.

Abstracts from Reports

A REPORT OF THE SIXTY-THIRD YEAR'S WORK IN INDIA AND BURMA OF THE MISSION TO LEPERS

September 1936—*August* 1937

WHEN Mr. Wellesley C. Bailey passed away in his sleep on 28th January, 1937, an epoch in the history of the Mission to Lepers came to its close. This apostle to the lepers had been the founder of the Mission sixty-three years before, and he was the last remaining personal link that held together the first beginnings and the work of to-day.

There is an appropriateness in the fact that in the year when an epoch in the mission's history closed, some new significant step should mark the opening of another. Within a week or two of Mr. Bailey's death the pioneers of the first after-care scheme in India for arrested cases were beginning to clear the jungle in a part of the six thousand acres of virgin forest land which has been set apart in the Central Provinces for the re-establishment in civic life of arrested cases, and of healthy children of lepers.

There is great significance in this project—for it would have been regarded as an impracticable vision only a few years ago. It emphasizes both the hopefulness and the limitations of treatment, and this dual emphasis is what is to-day required. Leprosy, on the one hand, can no longer maintain the unenviable reputation of being an altogether relentless, untreatable disease. On the other hand, though treatment (widely conceived and well-executed) can in many cases arrest and drive back the onslaught of the disease, and can render the infective case non-infective, there is unhappily evidence that patients who have known the joy of seeing their symptoms disappear watch with distress their reappearance, nearly always after they have had to return to conditions of poverty, stress, and under-nourishment. Sociological problems are knit into the very fibre of the medical problems attaching to the treatment—and prevention—of leprosy. This new scheme is calculated to give ex-patients a stake in the land, a healthy occupation carried on under sympathetic oversight, and such necessary support as may be required until the settler has won for himself resources for times of difficulty. Effective social rehabilitation for the ex-patient is almost as important in the leprosy worker's task as is direct medical treatment.

In the Homes of the Mission there has continued to be development—during the past year. No large building projects in any one station have been engaged in, but numerous smaller ones add up to make a considerable total of development during the year. During the twelve months' period under review the following buildings have been completed—two new women's wards at Dhamtari, and the first wing of a special section for boys with leprosy; operating theatres at Champa and Naini; a house for contagious leper boys at Purulia, additions to the girls' observation compound, and the entire re-modelling of the healthy boys' home; two new wards at Chevayur, near Calicut, one for boys and one for girls; a dispensary at Miraj and additional accommodation for adults; observation wards for boys and girls at Chandkhuri—that is, for those who have only very early symptoms, or are passing through their parole period after treatment before discharge; hospital buildings at Champa and Subathu for sick cases, or those requiring surgical attention; and a small home for young children of leper inmates at Kothara, near Ellichpur. Two further wards have also been donated by the mission to the aided leprosarium at Vengurla. And at several homes—Purulia, Nasik, Vadathorasalur, and elsewhere—water supply has been improved. Thus has the work continued to advance in size and usefulness.

It will be noted that much of the last year's development has been in providing more adequately for children suffering with leprosy. While the very early case is better outside an institution than in, if he attends a clinic but retains the home link, there are unfortunately many children for whom the institution is the only means by which they may be assured of proper care, and there is still a wide field for further development in this direction.

Among the adult patients the proportion of contagious cases in relation to the total continues to increase. This is as it should be, and the public should not forget the service which is being rendered to it as well as to the patients by the segregation of such cases. This higher proportion of contagious cases will probably lead to less striking statistics of results of treatment in future, and it seems very likely—unless there is some notable progress made in research work upon treatment—that the peak has been reached of the steadily ascending curve representing cases who have become disease-arrested in successive twelve-month periods during the last ten years. In 1936 the total of cases arrested without deformity having begun was 1,088. Any decline in future years must not be misinterpreted by failure to relate it to this other fact, since the highly contagious cases only respond very slowly to treatment, and frequently never clear up at all.

The mental and spiritual factors are ones upon which the mission has always laid emphasis, and it is encouraging to note the growing conviction of those who are primarily interested in the disease as a purely medical problem that these factors are of highly important, if not paramount, significance. There was a tendency in the past to say, 'We are interested in the strictly medical side of your work, the injections, the treatment of this and that symptom. The rest, of course, is outside our field of interest'. But now it is more and more being realized that the physical and psychological are inextricably interwoven.

There is a sense in which the finances of the mission continue to be satisfactory. They have enabled the work to grow steadily, and we are profoundly grateful to all who have helped make up the total of Rs. 8,12,315 spent on the mission's work in India and Burma during 1936. Apart from the amounts received by the Indian Auxiliary and by direct contribution to individual institutions, over three lakhs of rupees were sent from the headquarters in London of the Mission to Lepers, and represented contributions from many corners of the world. A Scottish Highland farmer may be the supporter of some leper boy in south India. A Sunday school class away in Tasmania may have made itself responsible for the support of a homeless leper woman, forsaken of her own kith and kin, who has turned to a Home in the heart of the Central Provinces. There is romance written large in much of the income which comes from outside India.

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The balance of the total was received from Government and local grants. From whatever source the income has come we are most grateful, and express our warm thanks.

There is another sense, of course, in which the financial position is most disturbing. So much remains to be done; so many are the calls for help; so great the opportunities of bringing not only cheer and comfort, but a new life. The mission has its aims and programmes for the future, and this next year should see the erection of the first buildings of a new home near Fyzabad. But there remain many opportunities which cannot be taken for lack of greater resources; and we again commend the work to the public for its support.

FINAL REPORT OF THE LEAGUE OF NATIONS MIXED COMMITTEE ON THE RELATION OF NUTRITION TO HEALTH, AGRICULTURE AND ECONOMIC POLICY*

THE report is the result of two years' work by an international committee of agricultural, economic and health experts under the auspices of the league. It is concerned for the main part with the economic aspects of nutrition policy and with its relations to agriculture. To complete the picture, a chapter on the physiological side of the problem from the interim report of the committee (The Problem of Nutrition, 4 Vols., 1936) has been included, modified in the light of recent nutrition research.

The report is divided into three parts. The first part, which has three chapters, gives a general survey of the problem and of the work already carried out. The introductory chapter traces the activities of the mixed committee since its inception and of other international bodies working on the problem of nutrition. The second chapter outlines the development of the science of nutrition and indicates the rôle played by nutrition in the striking improvement in public health and in the increase in population which occurred in the course of the past century. The third chapter summarizes the contents and conclusions of the report and reproduces the recommendations published by the committee in its interim report.

The second part of the report is devoted exclusively to the health aspect of nutrition. It contains a clear account of the main principles of the 'new knowledge of nutrition' as they have been developed by recent research; a description of the nature and functions of the most important vitamins and minerals and of the diseases resulting from their deficiency; an analysis of the nutritive qualities of various foods, and their classification as 'energy-bearing' or 'protective'; the dietary requirements of particular classes of persons, expectant and nursing mothers, infants, children of preschool and school age, adolescents, recruits and adults: and a summary of the dietary standards adopted by the technical commission of the Health Organization of the League of Nations and of the valuation placed by this commission on various important foodstuffs.

The third part of the report contains a more detailed examination of the economic and agricultural considerations connected with nutrition policy. It begins by tracing the main changes which have occurred in food consumption habits during the last few decades and reaches the conclusion that average consumption in most countries of western civilization has on the whole been tending in the direction of improved nutrition. The second chapter discusses the problem of the adaptation of agriculture to the desired changes in consumption. It is demonstrated that agriculture has shown considerable powers of adaptation in the past, in particular where no obstacles have prevented changes in demand from expressing themselves through changes in price. It is argued that an extension of the movement towards better nutrition should prove of benefit to national agricultural systems, calling both for an increased production of protective foods—fruit, vegetables and dairy products—and for an increased output of various cereals for fodder.

Denmark in changing over from the production of cereals for export into animal husbandry as the basis of her export trade did not for this reason cease to produce cereals. Instead, she actually doubled the national production of cereals—mostly in the form of feeding stuffs for farm animals.

Chapter III is concerned with the relation of food prices to consumption and shows that the demand for most foodstuffs—particularly for the protective foods—is very sensitive to price changes. The effects of price movements on the mutual substitution of various foodstuffs, the significance of seasonal price movements, and the differences in elasticity of demand in various income groups are also discussed.

The following chapter considers the main determinants of food prices on the supply side—technique and costs of production, commercial policy, marketing organization and distribution costs. Particular reference is also made to the contribution of the co-operative movement in reducing retail food prices.

The fifth and sixth chapters of part III are devoted to the rôles of income and of nutritional education in influencing consumption habits. The improvements in diet which accompany increased income are demonstrated from the results of family budget studies in various countries. A comparison between the existing distribution of incomes and the costs of minimum nutritionally adequate diets shows that malnutrition of important sections of the population, and particularly of families with many young children, even in such relatively prosperous countries as the United States and the United Kingdom, can be directly traced to the effects of poverty.

The committee realizes that the raising of the income level in the different countries is essentially a national problem of a long-range character. But it draws attention to the possibility of improvements in social services, which may in part remedy malnutrition due to poverty, such as family allowances, the provision of school meals, of milk for expectant and nursing mothers, etc. Much can also be done on the side of education to improve nutrition, and in this connection attention is drawn to the considerable variations in the quality of diet obtained by families spending at the same levels (relative to the size of the family). A summary is given of the various techniques of nutritional education which have been applied in different countries, and in some cases an indication of the effects achieved.

The report concludes with a collection of evidence relating to the present state of nutrition in various parts of the world, demonstrating that in spite of the considerable progress that has taken place in recent decades, the problem is still an urgent one. 'The malnutrition which exists in all countries is at once a challenge and an opportunity: a challenge to men's consciences and an opportunity to eradicate a social evil by methods which will increase economic prosperity'.

ADMINISTRATION REPORT OF THE BALUCHISTAN AGENCY FOR THE YEAR 1ST APRIL, 1935, TO THE 31ST MARCH, 1936

ON the night of 30th May, 1935, there were 112 indoor patients in the Civil Hospital, Quetta. Of these 73 were killed, while amongst the staff seven were killed including Major Bird, I.M.S., officiating civil surgeon, Quetta, who died three weeks after receiving severe injuries. The staff lost no time in rendering first aid to the injured and at dawn of the 31st morning work of first aid was in full swing in the general post office compound.

The staff of the Kalat Hospital and State Dispensary, Mastung, also displayed great energy in dealing with injured cases under the direction of the Political Agent, Kalat. A military medical relief party with two I. M. S. officers proceeded to Mastung on 3rd June

* Ser. L. O. N. P. 1937. II. A. 10, 327 pages. Price 7*s.* 6*d.* $2.00.

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and a field ambulance on 5th June. The Kalat Hospital was moved to Mangochur for relief work there. In the districts many injured were treated in the hospitals in Sibi, Loralai, Chaman, Pishin and Fort Sandeman, where they were removed by their relatives. In Sibi excellent work was done in connection with relief trains passing through from Quetta taking injured to Lahore and Karachi.

A special earthquake hospital was established at Pishin on 11th June, 1935, to which some injured cases were removed and on 15th August, 1935; this was taken over as a mission hospital and finally closed on 25th September, 1935. A special earthquake hospital was also established at Mastung Road by mission doctors on 13th June, 1935, and its cost was defrayed by Kalat State.

Quetta.—Martial law was proclaimed in Quetta on 1st June and the administration of Quetta including medical and public health passed to the military authorities from that date. Both injured and survivors were evacuated and within 10 to 12 days the population of Quetta was reduced to about 4,000 who were either local inhabitants or government servants.

The resources of the civil medical and sanitary departments were put at the disposal of the military authorities. The sanitary staff were however quite inadequate to meet urgent demands. An I. M. S. officer lent from the Punjab was appointed chief health officer and he took over charge of the public health department from the military about the middle of June. Other public health staff were also sent from the Punjab including medical officers of health, sanitary inspectors and sweepers.

The following table shows the strength of public health staff on different dates :—

	Medical officers of health	Sanitary inspectors	Sweepers
15th June, 1935 ..	11	11	273
26th June, 1935 ..	11	19	313
31st December, 1935.	2	5	264

This I. M. S. officer returned to the Punjab on 25th October, 1935, and the duties of chief health officer from that date came under the chief medical officer.

A refugee camp was opened at the brewery in July 1935 and a small dispensary was established there for the local needs of the people. The population gradually increased until it reached about 15,000 in December 1935, the increase being due to import of labour and salvage operations.

After the conditions consequent on the earthquake were overcome and dealt with, sanitary standards were well maintained and many groups of latrines and incinerators were erected in many areas—many of the groups being erected by the sanitary staff themselves.

The staff of the Civil Hospital, Quetta, were at first employed on the race-course. On 23rd July, 1935, the civil hospital staff returned to the site of the old civil hospital and opened a civil hospital in tents, where the sick were dealt with in the normal way and full activities as a civil hospital resumed. In October 1935 huts were constructed on the same site and the accommodation of the civil hospital became about 100 beds.

There were no epidemic diseases. As a preventive measure the whole population of Quetta was inoculated against cholera and vaccinated against smallpox in the months of June and July 1935. About 6,000 inoculations and 7,000 vaccinations were done. In view of the outbreak of cholera in Sind an inspection post was established at Mach on 24th June in which the railway authorities co-operated. All incoming trains were inspected until the epidemic in Sind died out and the danger of imported cases was over.

Anti-malaria work was taken up towards the beginning of July 1935 in all surrounding areas. Quinine was freely distributed in areas round Quetta and surrounding villages. In May 1935 before the earthquake a preliminary reconnaissance on malaria was undertaken by Major H. W. Mulligan, I.M.S., and on 25th July, 1935, a malaria survey arrived in Quetta under Major Mulligan.

In June 1935 the number of flies in Quetta enormously increased and became a great nuisance. Extensive fly measures were carried out with good results.

Exhumation of bodies.—The work of removal and disposal of the dead was stopped after the town was sealed. It was resumed by Rover Scouts under Mr. Hogg on 20th July, 1935.

At first all exposed bodies were disposed of and then bodies exhumed during clearance of roads. The scouts worked up to 17th October, 1935, and exhumed during this period 691 bodies. Exhumation work after this date was carried on by men of the road construction battalions trained in this work. A medical officer of health controlled this work in the city under the general control and supervision of the chief medical officer. All precautions were taken in dealing with these bodies such as immediate burning of all infected bedding and clothing and disinfecting the places from where removed by a solution of disinfectant.

Service Notes

APPOINTMENTS AND TRANSFERS

LIEUTENANT-COLONEL M. J. HOLGATE, O.B.E., has been appointed to officiate as Surgeon-General with the Government of Bombay, with effect from the 2nd April, 1938, afternoon.

Lieutenant-Colonel L. S. Modi, Superintendent, Central Jail, Nagpur, is appointed to officiate as Inspector-General of Prisons, C. P. and Berar, with effect from the 3rd April, 1938.

Lieutenant-Colonel A. C. Loganadan, Chief Health Officer, Delhi, has been appointed Officiating Assistant Director of Public Health, Punjab, Central Circle, with effect from the 14th April, 1938, *vice* Lieutenant-Colonel C. M. Nicol, granted leave.

Lieutenant-Colonel B. F. Eminson, Civil Surgeon, Hyderabad, Sind, is appointed as Civil Surgeon, Karachi, with effect from the 28th March, 1938 (afternoon), *vice* Lieutenant-Colonel M. J. Holgate transferred to the Bombay Presidency. Lieutenant-Colonel Eminson should also continue to officiate as Director of Health and Prison Services, Sind, in addition to his own duties pending further orders from Government.

Lieutenant-Colonel J. C. De, Superintendent, Campbell Medical School and Hospital, Calcutta, is appointed to be Civil Surgeon, 24-Parganas, *vice* Lieutenant-Colonel K. S. Thakur, granted leave.

Lieutenant-Colonel B. G. Mallya, Civil Surgeon, Howrah, is appointed to be Superintendent, Campbell Medical School and Hospital, Calcutta, *vice* Lieutenant-Colonel J. C. De, transferred.

Lieutenant-Colonel P. Banerjee, Civil Surgeon, Burdwan, is appointed to be Civil Surgeon, Howrah, *vice* Lieutenant-Colonel B. G. Mallya, transferred.

Lieutenant-Colonel N. C. Kapur, Civil Surgeon, Chittagong, is appointed to be Civil Surgeon, Burdwan, *vice* Lieutenant-Colonel P. Banerjee, transferred.

Lieutenant-Colonel M. A. Nicholson, an Agency Surgeon, on return from leave, is posted as Chief Medical Officer in Central India and Residency Surgeon, Indore, with effect from the afternoon of the 8th April, 1938.

Major B. Chaudhuri, Senior Medical Officer, Port Blair, is appointed as Superintendent, Cellular Jail, Port Blair, in addition to his own duties, with effect from the afternoon of the 16th March, 1938.

Major D. MacD. Fraser, Civil Surgeon, Dehra Dun, returned from leave on 29th March, 1938, forenoon.

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Major J. E. Gray, whose services have been placed at the disposal of the Sind Government, took over charge of the Office of the Civil Surgeon, Hyderabad, with attached duties, on the forenoon of the 7th April, 1938.

Captain M. Jafar is appointed Health Officer, Karachi Air Port, with effect from the forenoon of the 18th March, 1938, *vice* Captain C. J. H. Brink, transferred.

Captain J. Brebner, on general duty at the Medical College Hospitals, Calcutta, is appointed to be Civil Surgeon, Chittagong, *vice* Lieutenant-Colonel N. C. Kapur, transferred.

Captain G. F. Harris is appointed to officiate as an Agency Surgeon, with effect from the forenoon of the 14th March, 1938, and is posted to the North-West Frontier Province.

Captain C. J. H. Brink is appointed to officiate as Residency Surgeon, Kashmir, with effect from the forenoon of the 1st April, 1938.

The following appointments are made:—

Short Service Commissions

To be Lieutenants

Dated 1st October, 1937

M. L. Gujral.
B. N. Bhandari.
Mohan Singh.
B. L. Kapur.
D. R. Sharma.
P. S. Bassalvi.
G. N. Ahmadi.
P. M. Kaul.
A. K. Dev.
M. Akram.
D. S. Raju.
B. S. Bindra.
M. S. Chadha.
W. A. Mirza.

Indian Land Forces

H. L. Khosla.
S. P. Wanchoo.
S. Rameshwar.
B. H. Sayed.
V. Sivasankaran.
J. R. Vaid.
K. N. Rao.
B. S. Khurana.
R. Kasliwal.
T. D. Chablani.

Dated 2nd October, 1937
S. Sunkvally

Dated 10th October, 1937
A. S. Rao.
R. L. Soota.

Dated 11th October, 1937
M. Sankhla.

Dated 22nd October, 1937
K. S. Aiyer.

Dated 29th October, 1937
S. A. Mian.

Dated 15th November, 1937
V. P. Gupta.

Dated 5th December, 1937
Ivan H. B. Ghosh.

Dated 7th December, 1937
I. Malik.

Dated 9th December, 1937
M. S. Rao.

Dated 11th December, 1937
P. Dass.

Dated 13th December, 1937
K. S. R. Menon.

Dated 22nd December, 1937
S. A. Hasan.

Dated 27th December, 1937
Indar Singh.

Dated 3rd January, 1938
Z. H. Khan.

Dated 9th January, 1938
A. G. Khan.

Dated 7th March, 1938
C. Prakash.

Dated 29th March, 1938
V. R. Damle.

LEAVE

Major-General H. C. Buckley, K.H.P., Surgeon-General with the Government of Bombay, is granted leave on average pay for 5 months and 19 days followed by leave on half-average pay for 1 month and 12 days, with effect from the 2nd April, 1938, afternoon.

Lieutenant-Colonel N. S. Jatar, D.S.O., Inspector-General of Prisons, C. P. and Berar, is granted leave for 6 months *ex*-India, from the 3rd April, 1938.

Lieutenant-Colonel T. C. Boyd, Principal, Medical College, and Superintendent, Medical College Hospitals, Calcutta, is granted leave for 4 months, with effect from the 12th April, 1938, or from any subsequent date from which the leave is availed of.

Lieutenant-Colonel B. Gale, who was on leave *ex*-India till the 4th April, 1938, has been granted an extension of his leave up to the 8th December, 1938.

Lieutenant-Colonel C. M. Nicol, Director of Public Health, Punjab, proceeded on leave *ex*-India on average pay for 8 months, with effect from the 8th April, 1938.

Lieutenant-Colonel C. J. Lodge Patch, M.C., Medical Superintendent, Punjab Mental Hospital, Lahore, proceeded on leave *ex*-India, with effect from the 19th April, 1938.

Lieutenant-Colonel S. N. Makand, Director of Public Health, C. P. and Berar, is granted leave for 4 months *ex*-India, from 19th April, 1938.

Lieutenant-Colonel K. S. Thakur, Civil Surgeon, 24-Pargannas, is granted leave for 18 months, with effect from the 26th April, 1938, or the date on which he is relieved.

Previous notification is hereby cancelled.

Major D. Kelly, Civil Surgeon, Raipur, is granted leave for 4 months *ex*-India, from the 8th April, 1938.

PROMOTIONS

Majors to be Lieutenant-Colonels

R. C. Wats. Dated 26th March, 1938.
T. H. Thomas. Dated 8th April, 1938.

Captains to be Majors

J. H. Boultbee. Dated 29th April, 1938.
J. P. J. Little. Dated 30th April, 1938.
E. A. O'Connor. Dated 30th April, 1938.
P. L. O'Neill. Dated 30th April, 1938.

Short Service Commissions

Lieutenants to be Captains

M. L. Gujral. Dated 1st October, 1937, with seniority from 19th May, 1935.

B. N. Bhandari. Dated 1st October, 1937, with seniority from 21st May, 1935.

Mohan Singh. Dated 1st October, 1937, with seniority from 21st May, 1935.

B. L. Kapur. Dated 1st October, 1937, with seniority from 22nd May, 1935.

D. R. Sharma. Dated 1st October, 1937, with seniority from 23rd May, 1935.

P. S. Bassalvi. Dated 1st October, 1937, with seniority from 25th May, 1935.

G. N. Ahmadi. Dated 1st October, 1937, with seniority from 25th May, 1935.

P. M. Kaul. Dated 1st October, 1937, with seniority from 26th May, 1935.

A. K. Dev. Dated 1st October, 1937, with seniority from 31st May, 1935.

M. Akram. Dated 1st October, 1937, with seniority from 2nd June, 1935.

D. S. Raju. Dated 1st October, 1937, with seniority from 4th June, 1935.

B. S. Bindra. Dated 1st October, 1937, with seniority from 16th June, 1935.

M. S. Chadha. Dated 1st October, 1937, with seniority from 19th June, 1935.

W. A. Mirza. Dated 1st October, 1937, with seniority from 21st June, 1935.

Indian Land Forces

H. L. Khosla. Dated 1st October, 1937, with seniority from 11th February, 1936.

S. P. Wanchoo. Dated 1st October, 1937, with seniority from 22nd February, 1936.

S. Rameshwar. Dated 1st October, 1937, with seniority from 5th March, 1936.

B. H. Sayed. Dated 1st October, 1937, with seniority from 17th June, 1936.

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V. Sivasankaran. Dated 1st October, 1937, with seniority from 24th June, 1936.
J. R. Vaid. Dated 1st October, 1937, with seniority from 24th June, 1936.
K. N. Rao. Dated 1st October, 1937, with seniority from 1st July, 1936.
B. S. Khurana. Dated 1st October, 1937, with seniority from 1st July, 1936.
R. Kasliwal. Dated 1st October, 1937, with seniority from 23rd September, 1936.
T. D. Chablani. Dated 1st October, 1937, with seniority from 30th September, 1936.
S. Sunkavally. Dated 2nd October, 1937, with seniority from 2nd October, 1936.
A. S. Rao. Dated 10th October, 1937, with seniority from 10th October, 1936.
R. L. Soota. Dated 10th October, 1937, with seniority from 10th October, 1936.
M. Shankhla. Dated 11th October, 1937, with seniority from 11th October, 1936.
K. S. Aiyer. Dated 22nd October, 1937, with seniority from 22nd October, 1936.
Ivan H. B. Ghosh. Dated 5th December, 1937, with seniority from 5th December, 1936.
K. S. R. Menon. Dated 13th December, 1937, with seniority from 13th December, 1936.
Indar Singh. Dated 27th December, 1937, with seniority from 27th December, 1936.
Z. H. Khan. Dated 3rd January, 1938, with seniority from 3rd January, 1937.
A. G. Khan. Dated 9th January, 1938, with seniority from 9th January, 1937.
S. A. Mian. Dated 29th October, 1937.
V. P. Gupta. Dated 15th November, 1937.
I. Mallik. Dated 7th December, 1937.
M. S. Rao. Dated 9th December, 1937.
P. Dass. Dated 11th December, 1937.
S. A. Hasan. Dated 22nd December, 1937.
C. Parkash. Dated 7th March, 1938.
V. R. Damle. Dated 29th March, 1938.

The seniority of Lieutenant (on probation) G. B. Jackson is ante-dated to the 1st January, 1937.

RETIREMENTS

Major-General D. P. Goil, K.H.P. Dated 29th March, 1938.

(Previous notification, as it relates to the retirement of this officer, is hereby cancelled.)

Lieutenant-Colonel J. B. deW. Molony, O.B.E. Dated 3rd April, 1938.

Lieutenant-Colonel C. H. Smith, O.B.E. Dated 26th March, 1938.

Notes

NICOTINIC ACID B. D. H.

NICOTINIC ACID is stated to be a precursor of the 'P.P.' (pellagra-preventing) factor of the vitamin-B complex.

Nicotinic acid has been isolated from active 'anti-neuritic' concentrates, and it has therefore been inferred that it might be related to vitamin B_1. Subsequent investigations, however, have proved that nicotinic acid has no anti-neuritic properties, but it has been shown that it will cure black-tongue in dogs, a disease considered to be analogous to pellagra in man. The discovery that 'vitamin B_2' actually consists of three fractions [lactoflavine, vitamin B_6 (the rat dermatitis factor) and the pellagra-preventing factor] and that monkeys fed on a diet deficient in the 'P.P.' factor, but not in lactoflavine or B_6 develop 'monkey pellagra', suggested that nicotinic acid might be active in human pellagra, as it had proved to be in black-tongue. Nicotinic acid was therefore tried, first in monkey pellagra and then on human pellagrins. The conclusion reached was that the administration of nicotinic acid rectifies a deficiency in these pellagra-producing diets. Reference is made also to an investigation carried out in Egypt in which nicotinic acid was administered to two groups of pellagrins (with controls). In one group, on a poor diet, the action of the nicotinic acid was more or less confined to a specific effect on the erythematous lesions. In the second group, on a more balanced diet, both the erythema and the general condition of the patients improved.

It was concluded therefore that the 'P.P.' factor may not be the sole factor concerned in human pellagra. Nevertheless, the results so far obtained appear to justify the use of nicotinic acid in every case of pellagra.

Clinical application

A case of human pellagra is reported in which a dramatic recovery followed the administration of nicotinic acid in doses of 60 mg. daily for twelve days; it was found that no reaction followed the oral administration of nicotinic acid; intramuscular and intravenous injections, however, produced a marked but transient flushing. Pulse, blood pressure and respiration were not affected and the patient complained of no discomfort following intravenous injection. A slight feeling of warmth was produced however. The first signs of improvement were noticed twenty-four hours after the treatment was started in that there was '*a striking improvement in the appetite. . . .*' After forty-eight hours, mental confusion began to improve, and rationality returned after six days' treatment. The skin began to improve in three days, and was entirely normal in twelve days. On the seventh day the T waves as shown by the electrocardiogram were normal, and on the twelfth day the abdominal cremasteric reflexes were normal.

Reports of other investigations in which 15 pellagrins were treated with nicotinic acid demonstrated that this substance promptly relieves pellagrous glossitis, stomatitis, ptyalism, vaginitis, urethritis and proctitis and appeared to confirm the previous findings, establishing the view that nicotinic acid is an antipellagric factor, the results also being stated to furnish '*. . . evidence that the increased porphyrinuria associated with pellagra disappears on the administration of nicotinic acid*'.

In these cases larger doses were given than had been recommended hitherto, and it was tentatively suggested that 100 mg. of nicotinic acid five times daily is safe and effective in the average case of pellagra. Further, it was stated that it is rarely necessary to give nicotinic acid parenterally, but 10 to 20 mg. in sterile physiological saline, injected four times daily, gave remission of symptoms. On the other hand it was concluded that other substances, in addition to nicotinic acid, may be concerned in pellagra, and, accordingly, it was recommended that a well-balanced diet should form part of the treatment. Large quantities of meat, eggs and milk should be eaten by the patient.

Method of administration and dosage

In view of the reactions which follow intravenous and intramuscular injection of this substance it is recommended that nicotinic acid B. D. H. be administered orally. The dose suggested is 30 mg. twice daily after food. This dose may be increased, however, at the discretion of the physician. It has been stated that the maximum and minimum dose of nicotinic acid has not been determined, indeed up to 1,500 mg. have been given daily without producing toxic symptoms.

THE LATE SIR JAMES CRICHTON-BROWNE. LAST ADDRESS

BEFORE proceeding with the business of the forty-first Annual General Meeting of Bovril Limited, held in London on 28th February, 1938, the Lord Luke, K.B.E.,

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the chairman, said he would like to speak of the loss the Company, and indeed the country, had sustained in the death of Sir James Crichton-Browne. It would be impossible to exaggerate the value of his services to the Company, or the admiration his qualities of mind and character had inspired in his fellow directors. At the age of 97 Sir James showed very little diminution of his mental powers. The last thing he did, handicapped as he was by illness, was to prepare the address he proposed to deliver to the shareholders. This it would be his (Lord Luke's) privilege to read to the meeting.

In the address he had prepared, Sir James recalled how in 1897 the great Russian physiologist, Pavlov, had shown that the administration of meat extracts to dogs stimulated the mucosa of their stomachs and produced a copious secretion of gastric juice.

Remarkable experiments

It had been inferred that in human beings these extracts similarly increased the gastric flow, but no scientific proof of this had, until quite recently, been adduced. But during last year, by a remarkable series of experiments at King's College, London, Dr. Boon had demonstrated that meat extracts in varying degrees had the same effect in stimulating the gastric secretion in human beings that they had in dogs and other animals. This was a fact of first-rate importance. A wide range of typical food products was investigated, and it was found that of these Bovril was the most potent and rapid stimulant of the gastric mucosa.

By stimulating the mucosa to an increased flow of hydrochloric acid, Bovril restores the gastric juice to normal and assists recovery. That was an important finding, but the clinical significance of Dr. Boon's discovery was, in the opinion of Sir James, wider still. In such a disease of the stomach as gastritis, which was often the precursor of very serious trouble, there was a deficiency and alteration in the character of the secretion of the gastric juice, a deficiency and alteration which Dr. Boon's results suggested might be corrected by the judicious administration of Bovril, which so powerfully stimulated the secretion of gastric juice containing the essential hydrochloric acid.

It would seem prudent, therefore, for people at, or after, middle life, who suffered occasionally from indigestion, not dietetically explicable, or other gastric disorder, to try the effect of Bovril in warding off the often disastrous consequences of reduced gastric activity.

ANTITOXIN THERAPY IN GONORRHŒA

DR. T. ANWYL-DAVIES reports (*St. Thomas's Hospital Reports*, Vol. II, 1937) the following results in using antitoxin (Parke, Davis and Company) in the treatment of both acute and chronic gonorrhœa.

Dosage.—The average daily dose of this unconcentrated antitoxin was found to be 5 to 20 c.cm. when injected intramuscularly. Even with these small doses caution was necessary, as in some cases severe reactions occurred. The beneficial results, however, were beyond question, and it was found possible, even after severe reactions, to repeat the injection twenty-four or forty-eight hours later.

Following these preliminary trials, clinical work was continued with a concentrated antitoxin which proved to be approximately five times more potent than the unconcentrated product. Thus, it was found that the average dose was 1 c.cm., and that doses over 2 c.cm. caused in many cases a marked systemic disturbance. Because of this a routine procedure was adopted of injecting adrenaline chloride solution 1 : 1,000 at the same time as the antitoxin.

Conclusions.—The results obtained with gonococcus antitoxin have been distinctly encouraging. Acute and chronic cases, complicated and uncomplicated, respond equally well, which is in marked distinction to other biological preparations hitherto available for this condition. Reactions and results indicate that this antitoxin possesses specific therapeutic properties; properly regulated controls confirm this. The results with the improved unconcentrated product have been quite as satisfactory as with the experimental concentrated antitoxin, and in many cases smaller doses appear to be equally effective. The treatment of gonorrhœa depends largely on obtaining satisfactory drainage and it follows that any adjuvant measures to assist this, such as irrigations, douching, etc., should be employed.

Since the introduction of gonococcus antitoxin, accounts have been published in medical literature relating to sulphanilamide, in the treatment of gonorrhœa. Some report rapid cures in chronic, but not in acute, cases; others are favourably impressed by their results in acute, but not in chronic, cases. In spite of these discrepancies the drug has some action, but a true estimate of its effectiveness in relation to cure has still to be evaluated. Most of the failures occur in acute infections; this suggests that sulphanilamide may restrain the gonococcus but that it is unable to effect a cure until the patient has developed a certain immunity. If the rôle of this immune mechanism can be ascertained and applied in relation to this drug it may be of valuable assistance. Clinical evidence suggests that requisite antibodies can be supplied by the antitoxin and thus provide reinforced immunity which assists the action of the sulphanilamide. Possibly, by using this combination of antitoxin and drug a higher percentage of successful results may be obtained.

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Original Articles

ANAHÆMIN IN TROPICAL MACROCYTIC ANÆMIA

By L. EVERARD NAPIER, M.R.C.P. (Lond.)
C. R. DAS GUPTA, M.B., D.T.M.
R. N. CHAUDHURI, M.B.
G. N. SEN, M.B., D.T.M.
M. N. RAI CHAUDHURI, M.B.
P. C. SEN GUPTA, M.B.
and
D. N. MAJUMDER, M.B.
(*Calcutta School of Tropical Medicine*)

THE necessity for putting together these few notes on the action of anahæmin in tropical macrocytic anæmia was realized by the senior writer whilst he was reading this year's *Medical Annual*. In the section on anæmia, the reviewer, Professor S. Davidson, reporting the work of Dr. Lucy Wills and her co-workers (Wills *et al.*, 1937), says 'the authors believe that there are two factors in the more crude liver extracts which are of value in the treatment of macrocytic anæmias and that the more highly purified liver extracts may be less efficacious, since they only contain one factor'. He adds 'in the reviewer's experience no clinical evidence of this danger is at present available...'.

The writers were, of course, aware of this work and early last year took the opportunity of confirming Dr. Wills' suggestion, namely, that the highly-refined anahæmin would probably prove inactive in certain types of macrocytic anæmia as it had done in the macrocytic anæmia of monkeys.

However, we used anahæmin in only a very few cases and, although the senior writer mentioned this finding to a few workers in London last year, we did not consider that the few results were worth separate publication. We believe that the therapeutic test will prove a valuable one in classifying the different types of macrocytic anæmia that are encountered in India, and we were waiting until we could collect sufficient data to make an analysis of our cases worth undertaking.

As there is still at least one hæmatologist who questions the limitations of the therapeutic activity of the more refined liver extracts, we consider that we ought perhaps to report our findings to date. We will do this summarily and this paper must be considered as an interim report.

Group A. We used anahæmin in the treatment of six cases of macrocytic anæmia in pregnant women. The initial blood counts and some other relevant details are given in the table below.

TABLE I

Showing initial blood findings in pregnant anæmics treated with anahæmin

Serial number	1	2	3	4	5	6
Age	35	20	34	25	34	20
Gravida	4	3	4	3	8	2
Month of pregnancy	8	6	T	9	T	7
Hæmoglobin in mg. per 100 c.cm. ..	3.2	2.8	3.03	2.89	7.3	3.4
Red cells in millions per c.mm. ..	0.8	0.7	0.9	0.6	1.85	0.8
Reticulocytes per cent	3.8	18.4	0.4	2.4	1.3	1.8
Mean corpuscular volume (MCV) in cu. μ.	160	184	119	170	124	129
Mean corpuscular hæmoglobin (MCH) in $\gamma\gamma$.	37.2	38.7	31.6	45	39.4	38.7
Mean corpuscular hæmoglobin concentration (MCHC) per cent.	23.2	21.0	26.5	26.5	31.8	30.0
White cells in thousands per c.mm.	10.9	10.0	10 9	11.8	7.9	4.6
Polymorphonuclears per cent ..	63	..	85	53	76	62
Lymphocytes ,, ..	31	..	14	43	19	19
Large mononuclears ,, ..	2	..	1	2	3	2
Eosinophils ,, ..	4	..	0	2	2	..
Van den Bergh indirect, units ..	6.1	2.2	4.0	4	1	1.2
Normoblasts	+	..	..	+	..	+
Erythroblasts	+	..	..	+	..	+
Result	D	..	Im.	..	Im.	Im.

D = Died. Im. = Improved. T = Term.

In three cases the results we obtained gave us no information of value.

Case 1.—The patient died soon after child-birth on the 6th day after anahæmin had been given, after a reticulocyte rise from 3.8 to 7.8 per cent.

Case 2.—She had a high reticulocyte count before the anahæmin was given: she received two doses of 200 mgm. each, with a week's interval between them; the red cell count rose from 700,000 to 1,200,000 per c.mm. a week after the first injection but no further, and she left hospital a week later.

Case 3.—This was complicated by parturition on the day after the anahæmin was given and also by the house physician giving campolon as well: she had a reticulocyte response of 24 per cent on the 5th day after 200 mgm. of anahæmin.

In the next case there seems to have been a very definite response to anahæmin.

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Case 4.—She received only anahæmin, 200 mgm. on 13th July. On the 19th her reticulocyte count was 21 per cent and red cells had risen to 1,600,000 per c.mm. (*see* chart 1).

In the next two cases the action of anahæmin was less marked.

Case 5.—She had 200 mgm. of anahæmin on three consecutive days, 25th, 26th and 27th June; on 30th June the reticulocyte count was only 5.8 per cent and it had fallen again two days later. On 3rd July her red cell count had risen to 2,200,000, and a week later further to 2,600,000 per c.mm. She give birth to a live baby and left the hospital.

Case 6.—One dose of 200 mgm. of anahæmin was given: she had a low reticulocyte response and later a slight rise in red cells. Later, she had two injections of neohepatex fo 5 c.cm. each on two consecutive days and while there was only a low reticulocyte response there was a sharp rise in the red count a little later (*see* chart 1). Fractional gastric analysis showed a normal acid curve.

The information obtained from the treatment with anahæmin in these pregnant women is therefore inconclusive. One appears to have responded well, but in two others the response was indifferent, and one of these later responded better to neohepatex.

Group B. These were all Indian males (for initial hæmatological data *see* table II). The first three we can discuss very rapidly.

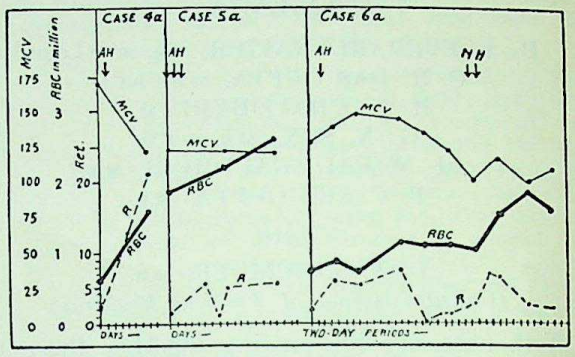
Case 1.—This was a case of kala-azar in which the anæmia was definitely macrocytic and rather more profound than usual. There was no response to anahæmin, naturally.

Case 2.—This was a hæmolytic case. Two c.cm. of anahæmin had no effect on the red cell count. Later campolon and ferrous sulphate were equally ineffective. Eventually recovery followed blood transfusion.

Case 3.—This was a case of macrocytic anæmia of an aplastic type, in which sulphanilamide is suspected of being the cause. Sternum puncture showed an aplastic marrow, with the nucleated red cells almost all normoblasts (*see* table III). Anahæmin, campolon, and other liver preparations completely failed to effect any improvement. After repeated blood transfusions his hæmoglobin was raised to 9.35 g. and when seen a month later there had been a slight further increase.

In the next case there was some slight response to anahæmin, but the main interest was that within a fortnight of anahæmin administration a macrocytic orthochromic case became a microcytic hypochromic, the cell volume falling to just half its pre-treatment figure.

CHART 1



Showing response in pregnancy anæmia.
AH = Anahæmin 200 mgm.
NH = Neohepatex.

TABLE II

Showing initial blood findings in male cases

Serial number	1	2	3	4	5	6	7	8	9
Age	41	..	16	30	28	40	37	35	..
Hæmoglobin in grammes per 100 c.cm.	5.8	2.75	2.3	4.95	6.18	3.57	7.56	4.8	5.2
Red cells in millions per c.mm. ..	1.60	0.74	0.74	1.66	1.72	0.85	1.84	1.15	1.33
Reticulocytes per cent ..	1.2	20.2	0.8	1.9	6	0.4	0.2	0.1	0.1
Mean corpuscular volume in cu. μ	123	147	116	105.1	127	141	124	118	113
Mean corpuscular hæmoglobin in $\gamma\gamma$.	36.1	37.3	33.4	29.8	35.9	42.1	41.1	41.5	39.1
Mean corpuscular hæmoglobin concentration per cent.	29.5	25.2	29.2	28.4	28.3	30.0	33.1	34.6	34.8
White cells in thousands per c.mm.	0.75	5.0	3.1	4.9	4.1	4.2	7.6	3.5	3.9
Van den Bergh indirect, units ..	1	4.4	Neg.	1	4	1	2.2	Neg.	4
Spleen, inches below costal margin	3	5	0	+	6½	0	0	0	..
Gastric analysis	?	N (−)	?	?	N	N	N (+)	H (−)	H (−)

H (−) = Hypochlorhydria less than 10 c.cm.
N = Normal acidity 25 to 45 c.cm.
N (−) = Within normal range but on the low side, 10 to 25 c.cm.
N (+) = Within normal range, but on the high side 45 to 65 c.cm.

Case 4.—Marmite was given for 14 days without effect. Then anahæmin 2 c.cm. was given: there was a rise in red cells from 1,710,000 to 2,640,000 per c.mm. in 14 days, without any reticulocyte response, and accompanied by a slight fall in hæmoglobin.

The blood picture was now microcytic and iron was given: there was a slight reticulocyte response and a rapid rising in hæmoglobin and red cells, ending in a normal picture within a month (*see* chart 2).

Cases in which there was definite response to anahæmin

The next two cases show the very definite action of anahæmin and we will therefore describe them in a little more detail.

Case 5.—Admitted 2nd February, 1937. A Bengalee Hindu, milkman, aged 28; he complained of weakness and increasing giddiness for three or four months. He had an occasional rise of temperature to 99.5°F. but no malarial parasites were found. He had been treated for kala-azar in our hospital two years previously. Splenic puncture showed no parasites.

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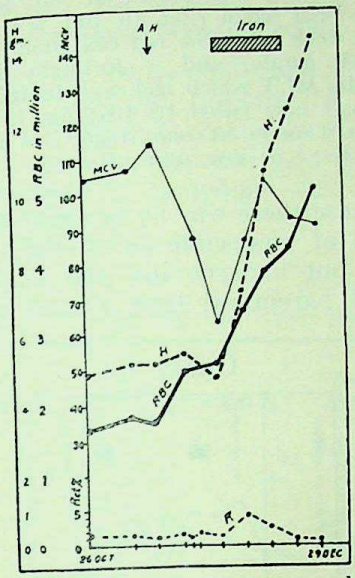
His anæmia was macrocytic orthochromic, and he had a large spleen and a strongly positive van den Bergh reaction. Gastric acidity was normal. Sternum puncture showed a marked normoblastic hyperplasia (*see* table III).

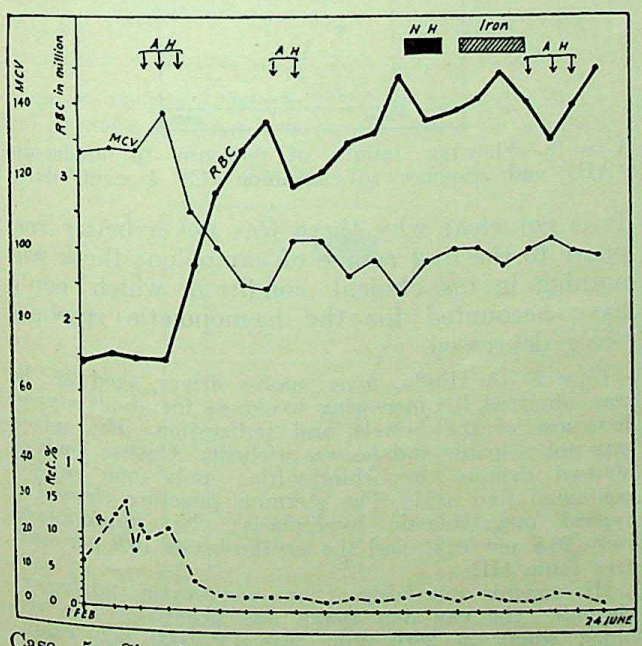
CHART 2



Case 4.—Showing response to anahæmin and later to iron.
AH = Anahæmin 200 mgm.

He had no treatment for three weeks and little change in his count occurred, except that his reticulocytes rose to 15 per cent and remained high for some days. He had three doses of anahæmin, 200 mgm. each, on 20th and 24th February and on 1st March—on 25th February the reticulocyte count was 11.6 per cent, the red cells 1,740,000 and the mean cell volume (MCV) 138 cu. μ. After this the red cell count rose sharply, the reticulocytes fell to 2 per cent, and the MCV fell below 100. Two more doses of anahæmin were followed by an immediate fall and then a steady rise in the red cell count to 3,700,000 but no reticulocytosis.

CHART 3

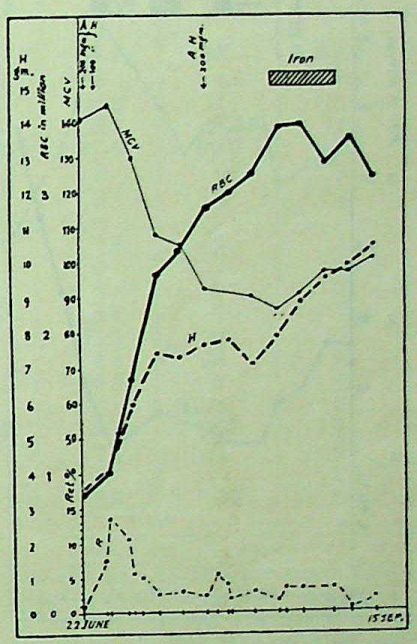


Case 5.—Showing response to anahæmin on two occasions and failure of response to another liver extract and iron.
AH = Anahæmin in 200 mgm. doses.
NH = Neohepatrat intramuscularly for 10 days.

Ten daily doses of neohepatrat were followed by a slight fall in red cells and again a slow recovery: iron for three weeks did not appear to have any action except that the red cells again fell to 3,250,000 per c.mm. and after three more anahæmin injections, the count rose to 3,750,000. The last anahæmin injection was followed by a sharp reticulocyte response of 7 per cent. Meanwhile the spleen had become reduced very considerably and was only just palpable on discharge, but the indirect van den Bergh was still positive, 4 units (*see* chart 3).

In this case there seems to be no possible doubt about the specific action of first doses of anahæmin, as the improvement was immediate. In the next case the action was equally clear, but there was in this case a reticulocytosis.

CHART 4



Case 6.—Showing red cell response to anahæmin (AH), and later hæmoglobin response to iron.

Case 6.—Admitted on 21st June, 1937. He was a hotel guide, aged 40, a Moslem. He had fever running up to 102°F. daily, but no parasites were found and his spleen was not enlarged. The sternum puncture showed a very marked megaloblastic hyperplasia (*see* table III).

The anæmia was macrocytic hyperchromic, the van den Bergh was 'doubtful', below 1 unit, at the first examination and was subsequently negative. His gastric analysis showed no free acid following the alcohol meal, but there was a good response to histamin.

He received 200 mgm. of anahæmin on 23rd June and 100 mgm. on the 25th. The reticulocytes rose from 0.4 per cent to 7.9 per cent on the 29th and 13.6 per cent on the 30th. The red cell count rose rapidly to 2,900,000 per c.mm. and the MCV fell eventually to 86 cu. μ and the mean corpuscular hæmoglobin (MCH) to 23 $\gamma\gamma$. Another anahæmin injection of 200 mgm. produced no result except a slight reticulocyte rise, and he was put on to iron, ferrous sulphate grs. vi three times a day, for 21 days. The hæmoglobin took a sharp turn upwards but he left hospital before cure was complete. With the improvement in his blood count the temperature fell slowly to normal (*see* chart 4).

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An interesting feature in this case was the improvement, first in the red cell count following anahæmin, and then the response of the hæmoglobin to iron.

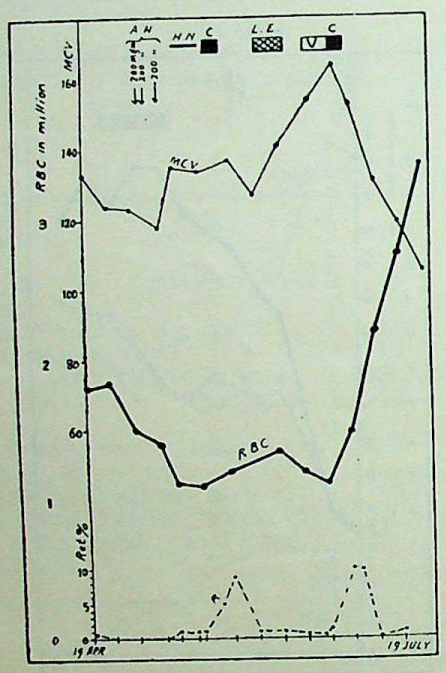
In neither of the histories of these cases was there any definite evidence of dietary deficiency: the first was a vegetarian but the second was not.

Cases in which there was no response to anahæmin but response to campolon

There are three cases in which anahæmin was apparently quite inactive, yet in which there was a typical response to campolon.

Case 7.—Admitted on 19th April, 1937, a Hindu, male, aged 37, personal servant. He had a low fever,

CHART 5



Case 7.—Showing failure of response to anahæmin and other substances and response to campolon.

AH = Anahæmin. HN = Heparnovina.
C = Campolon. V = Ventriculin.
LE = Liver extract intramuscularly.

temperature rising to about 100°F. daily: there was apparently no parasitic cause for this and no splenic enlargement. His tongue was red but not sore. Sternum puncture showed a certain number of megaloblasts and erythroblasts, but the picture was not the typical megaloblastic hyperplasia of pernicious anæmia (*see* table III). His gastric analysis showed a normal acid curve.

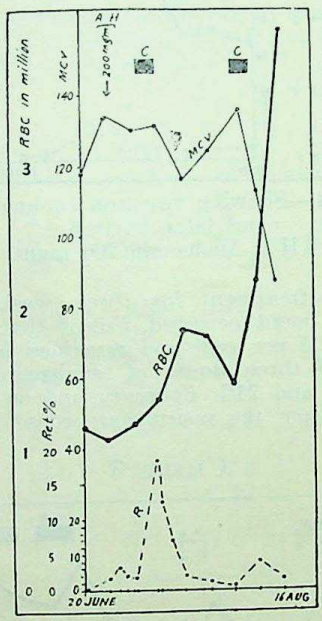
His anæmia was moderate in degree but was apparently progressive: it was macrocytic hyperchromic and the van den Bergh was about 1 unit.

On 3rd May his red blood count was 1,500,000 per c.mm. and reticulocyte percentage 0.6; he was given three doses of anahæmin of 200 mgm. each, on 5th, 7th and 11th May. His red cell count fell to 1,400,000 per c.mm. on 11th May and further to 1,130,000 on 15th May. His reticulocyte percentage never rose above 1 per cent. He was then given 'heparnovina', an ampoule three times a day by mouth for nine days, and his red blood count fell still further to 1,100,000, and there was no reticulocyte response.

On 24th May he was given campolon 4 c.cm. daily for five days: on 28th May his reticulocytes were 5.0 and on 31st May 8.8 per cent; by 7th June the reticulocytes had fallen again to 1.2 per cent, and now the red cell count was 1,500,000 per c.mm. He was then given liver extract*, 2 c.cm. daily for ten days, but the red cell count fell again to 1,200,000 on 21st June, so ventriculin was given, 20 gm. daily for seven days, but the red cells fell further to 1,110,000 on 28th June, and on the following day campolon was again given, 4 c.cm. daily for five days. Six days later the reticulocytes had again risen to 10.1 per cent and by 12th July, a week later, the red cell count was doubled, 2,220,000 per c.mm., and a fortnight later it was 3,410,000. His MCV which had risen to 165 cu. μ at one time and had now fallen to 105; his van den Bergh increased to 4 units at one stage, but fell and was either 'negative' or one unit after the last course of campolon.

In this case there was no possible doubt about the failure of anahæmin or of the response to campolon, but heparnovina and ventriculin by mouth and parenteral liver extract also failed.

CHART 6



Case 8.—Showing failure of response to anahæmin (AH) and response to campolon (C) 4 c.cm. daily.

It is not clear why there was not a better response to the first course of campolon; there was nothing in his clinical condition which could have accounted for the hæmopoietic response being depressed.

Case 8.—A Hindu, male, motor driver, aged 35: he was admitted for increasing weakness for about a year, looseness of the bowels, and indigestion. His spleen was not palpable and he was afebrile. Gastric analysis showed definite hypochlorhydria; only one sample contained free acid. The sternum puncture showed a typical megaloblastic hyperplasia; the megaloblasts were 26.8 per cent and the erythroblasts 16.8 per cent (*see* table III).

His anæmia was fairly severe, macrocytic and hyperchromic: the van den Bergh was negative. The red blood count on 28th June was 1,070,000 per c.mm. and the reticulocytes 1.6 per cent. Anahæmin, 200 mgm., was given: the reticulocytes never rose above 2.3 per cent and a week later the red cell count was 1,170,000 per c.mm.

*The liver extract was made by a very well-known firm and is a well-tried preparation. The dosage was that advocated in the treatment of pernicious anæmia: 1 c.cm. was said to be equivalent to 100 to 125 grammes of liver by mouth.

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Campolon was then given, 4 c.cm. daily for 5 days. On the 5th day the reticulocytes percentage was 18.4, and the red blood count rose to 1,850,000 in the next two weeks, but in another two weeks it had fallen again to 1,440,000 per c.mm. Campolon was again given and within two weeks the red cell count was 4,000,000 per c.mm. The MCV was as high as 136 cu.μ and fell after the second campolon course to 89 cu.μ.

Again, there can be no doubt about the failure of anahæmin and the response to campolon. The dosage of anahæmin should have been quite sufficient to produce a response, and it is obvious that the response to campolon was a response to the first dose.

Gastric analysis showed a very low gastric acidity—maximum 8 c.cm. N/10 HCl. Sternum puncture showed a marked hyperplasia of the red cell elements (75 per cent of nucleated cells) but only 4 per cent of megaloblasts (*see* table III). The anæmia was of moderate degree, macrocytic and hyperchromic: the van den Bergh was 4 units at the first examination, but subsequently was not higher than 1.5 units. The Price-Jones curve showed the mean diameter as 8.095μ and the coefficient of variation as 13.01 per cent (*see* chart 8).

Anahæmin, 200 mgm., was given on the 9th day in hospital when the reticulocytes were 4.6 per cent, the last red cell count was 1,330,000 per c.mm. The reticulocytes fell to 1.6 on the 4th day, but were 7.8 on the 5th day and 2.6 per cent on the 7th day. The

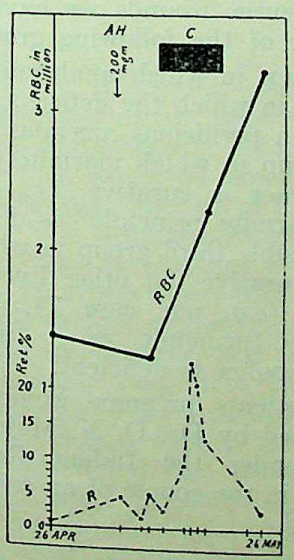
TABLE III

Showing sternum puncture findings; percentage of nucleated cells

Serial number	6a.	1	3	5	6	7	8	9
Total nucleated cells in thousands per c.mm.	25.0	..	9.8	39.0	..	60.0	..	32.4
Red cell series	**30**	**59.6**	**38.5**	**77**	**69.2**	**33**	**57.2**	**75.5**
Megaloblasts	0	3	1.5	0.5	28	4.5	26.8	4.0
Erythroblasts	3	10.4	2	8.5	19.2	11	16	4.5
Normoblasts	27	46.2	35	68	22	17.5	14.4	67.0
Granular series	**59.5**	**34.4**	**49.5**	**19.5**	**27.6**	**60.5**	**32.8**	**19.5**
Myeloblasts	0	0	0	0.5	0	0.5	0	0
Premyelocytes	0	1.2	0	0	0	0	2	0
Myelocytes—								
Neutrophile	5.5	5.6	6	1.5	4.8	6	4.8	4.0
Eosinophile	0.5	0.4	6.5	0	0	2	0.4	0.5
Basophile	0	0	0	0	0	0	0	0
Young forms	3	7.2	5.5	5	6.4	7	4.4	5.0
Band forms	28.5	16.4	10.5	5	11.6	20	10.8	7.5
Segmented forms	20.0	0.4	5.5	3	4.4	20	9.2	2.0
Eosinophile	1.5	3.2	15.5	4.5	0.4	5	1.2	0.5
Basophile	0.5	0	0	0	0	0	0	0
Non-granular series	**10.5**	**6.0**	**12**	**3.5**	**3.2**	**6.5**	**10**	**5.0**
Lymphocytes	7.5	2	7.5	2.5	2.4	3	6.8	4.5
Large mononuclears	1.5	3.6	3	1	0	3	2.8	0
Plasma cells	1.5	0.4	1.5	0	0.8	0.5	0.4	0.5

Case 9.—A coolie attached to the Medical College, aged 50, male, suffering from breathlessness for a month

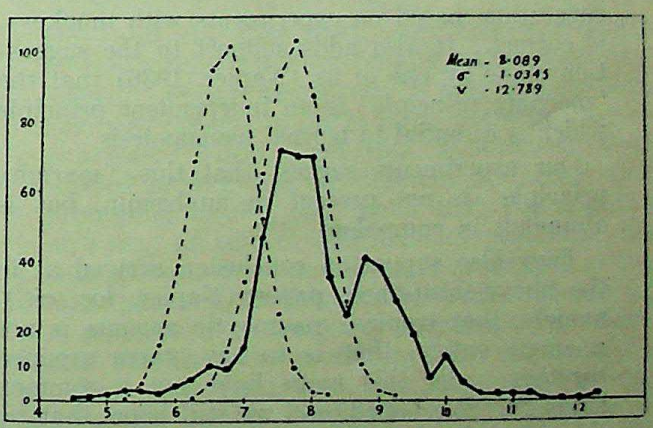
CHART 7



Case 9.—Showing failure of response to anahæmin and subsequent response to campolon.

or so. Spleen not enlarged: fever up to 102°F., for which no parasitic cause could be found; this came down gradually to normal as the anæmia improved. red cell count fell to 1,210,000 per c.mm. and campolon, 4 c.cm. daily, was then given. Reticulocytes were 9.2 per cent on the 3rd day, 24 per cent on the 4th, and 21 per cent on the 5th day. On the 7th day the

CHART 8



Showing Price-Jones curve of case 9.

red cell count had risen to 2,300,000 per c.mm. and by the 15th day the red cell had risen to 3,290,000 per c.mm. and the reticulocytes had fallen to 2.8 per cent.

There is in this case just a suggestion that the anahæmin might have stimulated hæmopoiesis, but this seems doubtful, and there is no doubt

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about the far greater stimulus given by campolon.

The dietetic history in these three cases was difficult to obtain, but they were all nominally vegetarians and an actual food deficiency cannot be excluded.

Summarizing our experience with anahæmin, we can say that in one case of pregnancy anæmia and in two cases of macrocytic anæmia in men there is evidence of the specific action of anahæmin, and that in three other cases of macrocytic anæmia in men, in which campolon stimulated a very definite hæmopoietic response and eventually brought about cure, anahæmin was inactive.

Discussion and conclusions.—In so-called tropical macrocytic anæmia, marmite, which contains the extrinsic factor, will effect a cure, but so also will the ordinary liver extract, as it contains both extrinsic and intrinsic factors.

Anahæmin, a highly refined liver extract, which is supposed to contain hæmotopoietin, the combined extrinsic and intrinsic factor, given alone, is a very efficient therapeutic agent in pernicious anæmia. Anahæmin given in adequate doses will not, however, produce any response in *some cases* of tropical macrocytic anæmia in which campolon will afterwards effect a cure.

If therefore we assume that anahæmin does contain the extrinsic factor, we must conclude that it is not by virtue of their content of extrinsic factor that marmite and crude liver extract effect a cure in tropical macrocytic anæmia, but on account of the presence of some other hæmotinic agent.

These experiments will require to be repeated on a quantitative basis—as it might be argued that anahæmin whilst containing a full quota of intrinsic factor contains a relatively smaller quantity of extrinsic factor—but as they stand they do seem to indicate that Dr. Lucy Wills' suggestion, based on experiments with monkeys, is correct. It also adds support to the suggestion made by one of us (Napier, 1936) that the 'marmite principle' is an independent principle which is essential to normal hæmopoiesis.

Our experiments suggest that this 'marmite principle' is not present in anahæmin, but is abundant in campolon.

They also support a conclusion arrived at in the above-mentioned paper (Napier, *loc. cit.*), namely, that tropical macrocytic anæmia is not a single entity, that is to say, cases grouped together under this name have not a common ætiology. We hoped, and we still hope, that by the aid of the therapeutic test, it may be possible to arrange this large group of cases into smaller groups with common ætiological, hæmatological, and/or clinical characters; but the results reported are not encouraging. There seem to be no common characters in either group that are peculiar to that group; for example, of the cases

(*Continued at foot of next column*)

PROTAMINE ZINC INSULIN

By J. P. BOSE, M.B., F.C.S. (Lond.)

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Introduction.—One of the main difficulties encountered in the use of insulin in clinical diabetes has been its transient but sometimes severe action causing dangerous oscillations in the blood-sugar level. A fact brought out soon after the discovery of insulin was that, as the methods for purification of insulin were improved upon, the action was intensified but the duration was found to be lessened, and though some of the other disadvantages of insulin, such as the local and general skin reactions, disappeared with increased purity, its intensified but short-lived action constituted a great drawback in that the patients were left to oscillate between hypoglycæmia and hyperglycæmia. It was thus found that, to obtain the most favourable results, insulin had to be administered in small doses but at frequent intervals. This was certainly a very great disadvantage, not only from the point of view of the patient but also from that of the doctor.

To overcome all these drawbacks of 'ordinary' insulin, a search has been going on for some time past to find an insulin compound which will have a slower action, causing a more gradual lowering of blood-sugar over a prolonged period. This would then simulate the normal way in which insulin acts in our system, *i.e.*, by a regulated and almost continuous secretion from the normal pancreas.

(*Continued from previous column*)

showing a characteristic megaloblastic hyperplasia there is one in each group.

On therapeutic grounds we have evidence of the existence of the following groups :—

(*a*) A group in which anahæmin is curative, *i.e.*, in which the deficiency is the same as in pernicious anæmia.

(*b*) A group in which marmite or crude liver extract is curative, *i.e.*, in which the 'marmite principle' is deficient.

(*c*) A possible third group in which campolon is curative but other liver extracts are not (*e.g.*, our case 7), *i.e.*, in which some principle which is peculiar to campolon is deficient.

The six patients, pregnant women, in group A were examined by Dr. D. N. Majumder, who is a worker under the Indian Research Fund Association, in the course of an enquiry financed by that fund.

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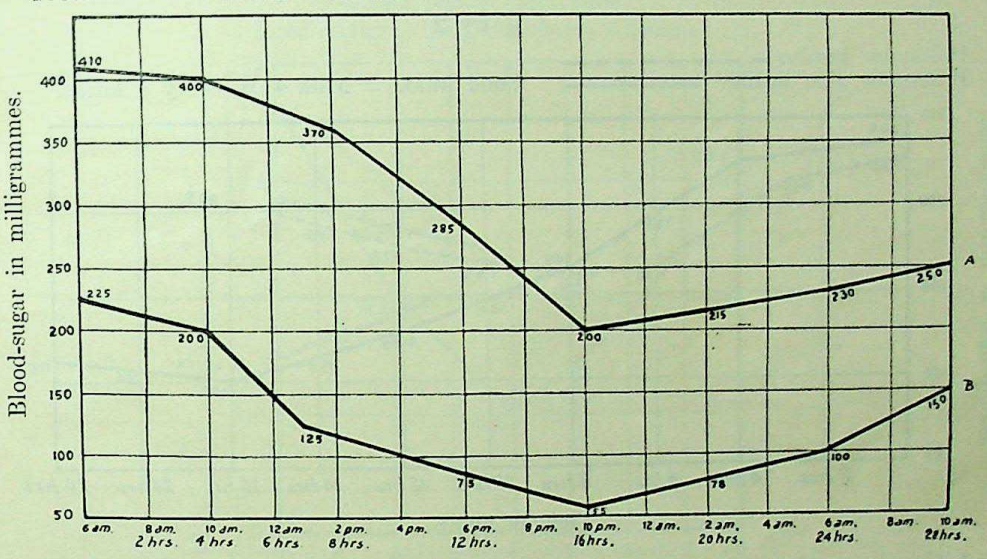
These considerations have been in the minds of workers in different parts of the world, who have been trying to find means of retarding the rate of absorption of insulin, so that a more or less continuous and sustained action could be obtained. Various methods to retard insulin action, such as using it as an oily suspension, injecting insulin with some vaso-constrictor substances, preparing an insulin compound sparingly soluble in tissue fluids so as to retard the rate of absorption, etc., have been tried without any final or lasting success till 1936 when Hagedorn and his Danish colleagues at Copenhagen introduced to the world a new insulin compound, 'protamine insulin' or 'insulin retard', which was recognized to have several distinct advantages over the ordinary insulin. This new insulin compound was employed therapeutically in Denmark for a fairly long time before it was put on the market as 'insulin retard'.

When the precipitate in suspension is injected subcutaneously it is deposited in the subcutaneous tissues, and there is a steady and prolonged absorption of insulin liberated from the solid particles, thereby causing a continuous and prolonged action on the blood-sugar.

Hagedorn's discovery naturally stimulated very keen and intensive research and his results were soon confirmed by Joslin and others (1936), and later on at the Mayo Clinic and by the Toronto group of workers. As a result of such extensive research, various modifications of the original method of Hagedorn soon appeared, the most noteworthy amongst these being that of D. A. Scott of the Connaught Laboratories in the University of Toronto. Scott (1934) and Scott and Fisher (1935) working with crystalline insulin of Abel and others (1927) found that the crystallization of insulin was only possible in the presence of certain inorganic salts, notably

CHART 1

Protamine zinc insulin = 30 units. Food intake = Milk 4 oz. every 4 hours.



Discovery of protamine zinc insulin.—The idea behind Hagedorn's discovery was to produce a compound of insulin with a basic protein substance which would be slowly soluble in the tissue fluids so that the rate of absorption would be slower. The ordinary insulin being highly soluble and acid in reaction was very quickly absorbed. To attain this object, Hagedorn *et al.* (1936) tried to link insulin hydrochloride with the different protamines and found that the mono-protamines were most suitable for the purpose and the best result obtained was from the sperm of *Salmo iridius*, the rainbow trout. Hagedorn also found that when insulin hydrochloride was made to combine with this protamine and was buffered in such a way that the iso-electric zone of the compound was brought near the pH 7.2 (*i.e.*, the pH of the tissue fluids) a fine precipitate of insulin protaminate was formed. This finely-divided white precipitate was found to contain the active substance. zinc, and also that when more zinc was added to the insulin the rate of absorption was prolonged. Fisher and Scott (1935) found that zinc was present in fairly large quantities in the pancreas. Working on this hypothesis, they started mixing zinc in different strengths with protamine insulin and found that the addition of 1 mg. of zinc to 500 units of protamine insulin gave a more definite and prolonged action and enhanced its therapeutic value. Moreover, in addition to causing a greatly improved effect, zinc stabilized the protamine zinc suspension.

This new compound has been called protamine zinc insulin. It has been shown that with one injection of this insulin the blood-sugar control is maintained for nearly 24 hours, as compared to protamine insulin, or insulin retard, the blood-sugar control of which lasts from 12 to 18 hours (chart 1).

After the discovery of protamine zinc insulin, a good deal of controversy arose as to whether

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continued injection of zinc into the system was likely to produce toxic effects like those of lead; various other metals such as calcium, nickel, etc., were tried. Incidentally, it might be mentioned that certain other substances, such as ferrous chloride, magnesium and other allied metals and certain lipoid substances, were also used in this connection with a view to making new compounds with insulin, but the most important work in this line seems to be that of Bischoff (1936) who prepared an insulin-tannic-acid suspension, which when injected into rabbits produced a delayed absorption of insulin and a prolonged hypoglycæmic effect. The addition of zinc to this insulin-tannic-acid suspension was found to enhance the hypoglycæmic effect still further. The injection of this compound, however, was found to be extremely painful and in most patients erythema and subcutaneous swelling developed.

Rabinowitch and others (1936) raised a very important question as to whether an excess of zinc would inhibit the action of endogenous or exogenous insulin. Fazekas and Himwich (1936) showed that traces of zinc (0.1 per cent), such as used by Scott, would produce no deleterious effect but if the concentration of zinc was increased to 0.9 per cent, the blood-sugar-lowering effect of insulin could be inhibited altogether. As a matter of fact, Drinker, Thompson and Marsh (1927) produced a general fibrosis of the pancreas in cats by giving excessively large amounts of zinc.

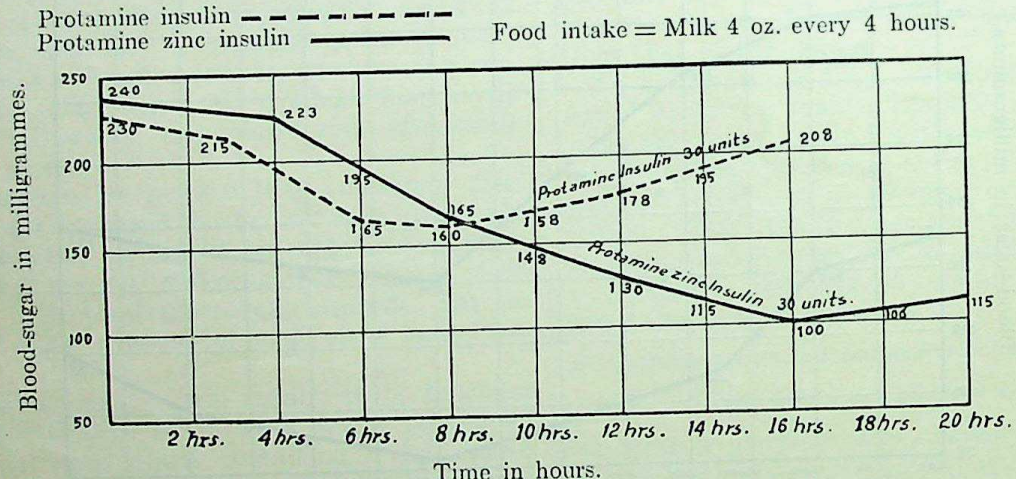
It appears to me that the minute traces of zinc which are present in protamine zinc insulin are not likely to cause much ill effects, local or general. The amount of zinc added is very small, *i.e.*, 1 mg. per 500 units, so that a moderately severe case of diabetes taking an average dose of 30 units daily would receive not more than 0.25 gramme of zinc in 10 years.

Action of protamine zinc insulin.—When a dose of protamine zinc insulin is injected subcutaneously, the blood-sugar usually shows no change until about 3 to 4 hours after the injection, when it begins to fall. The rate of fall of blood-sugar, though much slower than that with ordinary insulin, however, continues for a longer time and if the food-intake is restricted, a maximum fall is obtained in 12 to 16 hours after the injection, sometimes causing symptoms of hypoglycæmia to appear. Thereafter, the blood-sugar rises slowly but does not usually attain the pre-insulin level till about 24 to 36 hours after the injection (chart 2).

The action of protamine insulin differs from that of protamine zinc insulin in that the action of the former begins 3 hours after the injection, the maximum fall of blood-sugar takes place within 6 to 8 hours, and the effects last from 14 to 18 hours.

The action of ordinary insulin on the other hand begins almost at once, the fall of blood-sugar taking place within half an hour after the injection, the maximum fall of blood-sugar takes place within 3 to 6 hours, and the effects usually last from 8 to 10 hours.

CHART 2



It therefore appears that protamine zinc insulin, owing to its slower and long-continued action, has certain advantages over the protamine insulin, or insulin retard, and certainly many more over the ordinary insulin hydrochloride. One of the immediate advantages of the protamine zinc insulin over the ordinary insulin, especially from the point of view of the patient, is in the reduction of the number of daily injections. Ordinary insulin, with its relatively rapid but transient action, lasting for about 8 hours or so, requires to be given repeatedly to cause an effective control over the blood-sugar throughout the day, in severe cases of diabetes. Protamine zinc insulin on account of its less rapid but more persistent and continuous action is better able to prevent the hyperglycæmia for much longer periods and thus to effect a much better control over the blood-sugar level, often without a repetition of the dose. This appears to be a great boon to severe diabetics who have to be awakened during the night to get their dose of insulin, in order to

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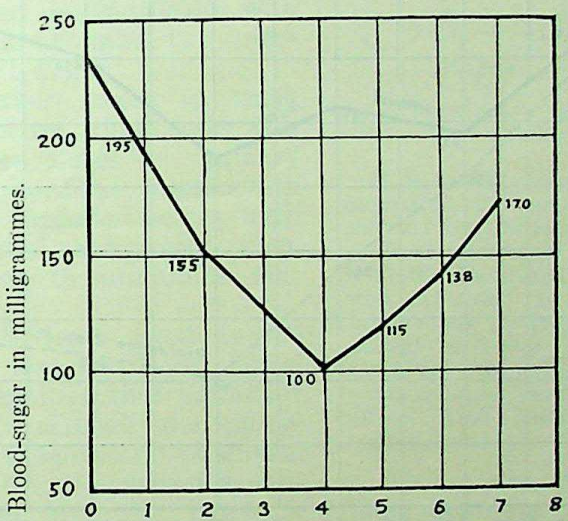
prevent the early morning hyperglycæmia, for, as is generally known in severe cases of diabetes, a fairly marked hyperglycæmia usually occurs during the early hours of the morning, and a dose of ordinary insulin given in the evening is insufficient to keep the blood-sugar down during the long interval of 10 to 12 hours during sleep. Protamine zinc insulin, on account of its long-continued slow action, is better able to keep the blood-sugar under control during the night and reduce the early morning hyperglycæmia.

The occurrence of nocturnal hyperglycæmia is even more characteristic in juvenile diabetes, in which there is almost always a peculiar 'W'-shaped blood-sugar curve. The control of blood-sugar in such cases is only possible by giving the patient two injections, one at retiring, say, at 9 p.m., and one in the early morning, say, at about 3 a.m.; but such a procedure, apart from the great discomfort both to the patients and his relatives, is not always free from the danger of

CHART 3

Ordinary insulin = 30 units.
Food intake = Milk 4 oz. every 4 hours.



an occasional over-dose. Since the discovery of protamine zinc insulin, however, the treatment of juvenile diabetes has been revolutionized. It has flattened the 'W'-shaped curve considerably, as will appear from the charts.

Disadvantages of protamine zinc insulin.—I have just stated that the maximum fall of blood-sugar takes place within 12 to 16 hours after a dose of protamine zinc insulin is injected, sometimes causing symptoms of hypoglycæmia to appear (chart 1, B). The hypoglycæmia is, however, more subtle in onset and, as the subjective symptoms are less severe than with ordinary insulin, the usual early symptoms such as tremulousness, sweating, palpitation, may be quite unnoticed by the patient even when the blood-sugar is as low as 60 mg. per cent.

The early symptoms of hypoglycæmia, due to protamine zinc insulin being thus unnoticed by the patient, often gives him a false sense of security and on account of the persistence and continuousness of the action he is likely to develop into severe hypoglycæmia without warning even when he is under observation. This, certainly, is a great disadvantage in the use of protamine zinc insulin as distinct from ordinary insulin, the hypoglycæmia of which occurs with almost specific regularity and with specific symptoms.

A second disadvantage of protamine zinc insulin is the uncertainty of its summation or cumulative effect, on account of its action lasting somewhat over 36 hours. Even when the patient receives one injection daily, the residual effect of the insulin given on the previous day, combining with that of the fresh dose, will tend to enhance its action and the continuance of the same large dose for an indefinite period is likely to produce undesirable results.

A third disadvantage is that there is no uniformity of action of protamine zinc insulin, the rate of its absorption from the tissues is not constant, varying according to the state of vascularity of the tissues into which it is injected, and hence the rate of reduction of the sugar content of the blood is often not constant, but variable even with the same dose.

Another disadvantage of protamine zinc insulin is that, owing to its slow absorption, it takes a longer time to come into action. Thus, if it is given before breakfast, as is usually done, it would not be able effectively to control the post-breakfast hyperglycæmia and glycosuria. For the same reason, it does not also effectively control the rapidly increasing hyperglycæmia following a high carbohydrate diet, or in cases of severity with complications such as coma, etc. In such cases the physician is likely to find himself involved in the error of giving very large doses in his effort to reduce the blood-sugar quickly. This, as previously mentioned, will produce, by its cumulative effects, hypoglycæmic

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reactions of serious consequence, particularly in advanced heart cases.

Still another disadvantage of protamine zinc insulin that may be mentioned is its uncertain keeping properties. The opinion amongst the various workers is not final yet as to how long this insulin keeps its full potency and at the present moment all manufactured protamine zinc insulin has to be dated. The expiration date, as printed on the bottle, is six months from the date of manufacture.

Advantages of protamine zinc insulin.—The new insulin compound, however, possesses several advantages over the ordinary insulin; one of the greatest has already been mentioned, namely, that owing to the slow action continuing throughout the night, it controls the hyperglycæmia, glycosuria and ketosis during the night, without the patient having to take one or two nocturnal injections. This is certainly a great boon to severe diabetics, more particularly of the juvenile type.

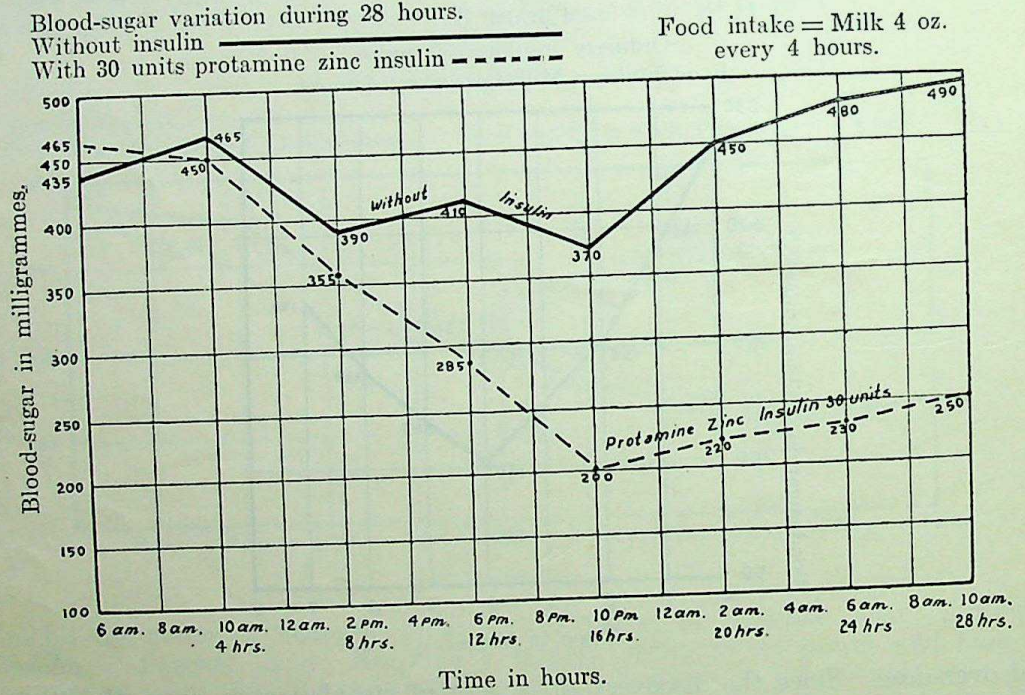
A second advantage is that the high carbohydrate diet can be spread out more evenly over all the meals, instead of being mainly confined to those following the insulin injection, as has hitherto been done.

A third advantage is that, if the dose be carefully regulated, there is less likelihood of sudden reduction of blood-sugar and this obviates the risks of hypoglycæmia during sleep. Another advantage I have noticed is that patients treated with protamine zinc insulin notice a greater sense of well-being.

In my experience with protamine zinc insulin I have found that some of the severe cases of diabetes, which required two or more injections of ordinary insulin in a day to keep the blood-sugar under effective control, can now be controlled with one effective dose of protamine zinc insulin. Further, it has been found possible, in a certain number of cases, gradually to reduce the dose of protamine zinc insulin. One of my cases, a severe diabetic, used to be on an average daily dose of ordinary insulin varying from 40 to 50 units (taken in two injections) for the last 14 years. Since the advent of the protamine zinc insulin she was put on one injection daily and it has been possible to reduce the dose to 10 to 15 units only, to keep effective control over the blood and urine sugar.

Selection of cases.—In mild or moderate cases, the ordinary insulin, taken once before breakfast, may be wholly replaced by protamine zinc insulin. In the more severe cases it has been found more satisfactory to combine ordinary insulin with the protamine zinc insulin during the first few days of treatment and then gradually to eliminate the ordinary insulin. The reason for this procedure is that, as has already been stated, protamine zinc insulin is slow-acting and hence unable to control the post-breakfast hyperglycæmia. If, however, a dose of ordinary insulin is given as usual before breakfast, it will effectively control the hyperglycæmia due to food; protamine zinc insulin can then be given 8 hours later and this will help to check the nocturnal and early morning hyperglycæmia; the dose of the ordinary insulin next morning can then be reduced, and finally it can be replaced wholly by one single dose of protamine zinc insulin. The stabilization of the patient to the proper dose of insulin should preferably be done in an institution.

CHART 4



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Regarding the comparative dosage of ordinary insulin and protamine zinc insulin, opinions differ. When replacing ordinary insulin wholly by protamine zinc insulin in mild or moderate cases, I usually start with 75 per cent of the total previous dosage of the ordinary insulin in one injection given before breakfast, increased later on if necessary. In more severe cases, where a combination of both kinds of insulin is necessary, 25 per cent of the total dose should be given in the form of ordinary insulin before breakfast, and the remaining 75 per cent of the dose should be given in the form of protamine zinc insulin in the evening. This usually causes an effective control over the blood-sugar during the night and helps to reduce the early morning hyperglycæmia. The dose of ordinary insulin can thus be gradually decreased and subsequently wholly replaced by protamine zinc insulin.

As to what the attitude of the general practitioner should be with regard to changing a patient from ordinary insulin to protamine zinc insulin, my suggestion is that those diabetics who are well-controlled and in good health with the ordinary insulin and do not mind two injections a day should be left alone.

In severe diabetes, where there is much ketosis, the best plan is to treat these cases with either large and repeated doses of ordinary insulin or a combination of ordinary insulin with protamine zinc insulin, as suggested before, until the condition has improved sufficiently, when they can be switched on to protamine zinc insulin.

The question now arises as to what is the exact place of protamine zinc insulin in clinical diabetes. Though it is admitted that protamine zinc insulin has passed through the purely experimental stage and has moved on to clinical trials, yet nobody has gathered sufficient experience to lay down hard and fast rules; moreover this is not possible because of the lack of uniformity of its action, depending no doubt on the rate of absorption from the tissues. Besides, in dealing with new therapeutic preparations one should always be on guard to avoid unwarranted claims and inferences before a proper evaluation of the drug has been satisfactorily established by long clinical and laboratory experience. As it stands at present, there is certainly room for improvement both in the preparation of the drug and in the mode of its administration.

All we can say at present is that protamine zinc insulin is a powerful weapon and is destined to prove a more useful one than the ordinary insulin; its introduction certainly constitutes a step forward in the treatment of clinical diabetes.

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(*Continued at foot of next column*)

A NOTE ON THE THERAPEUTIC EFFICIENCY OF SOLUSEPTASINE IN SIMIAN MALARIA (*P. KNOWLESI*)

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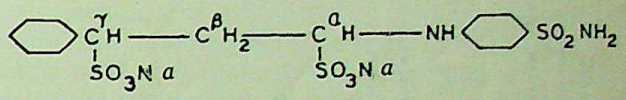
BREVET-COLONEL, I.M.S.
Honorary Physician to the King,
and
B. M. DAS GUPTA
(*From the School of Tropical Medicine, Calcutta*)

WHILE discussing with the writers the problem of treatment of leptospiral infection by synthetic drugs, Mr. Harold Walker, representative of Messrs. May and Baker, Ltd., suggested that the effectiveness of soluseptasine, which like other compounds of the sulphonamide group has earned a great reputation for its bactericidal properties, particularly in streptococcal infections, might be tested on this infection as well.

Soluseptasine is a white crystalline powder of well-defined chemical constitution. The chemical formula is as follows:—



Disodium-p (γ-phenyl-propyl-amino) benzene-sulphonamide-α-γ-disulphonate.

It is readily soluble in water to give a solution of approximately neutral reaction. The concentration selected by the manufacturers for clinical use is 5 per cent. A solution of this strength is very nearly isotonic with the blood and is, according to the manufacturers, well tolerated by subcutaneous, intramuscular, or intravenous injection by all the common laboratory animals, and also by man. It is said to be much less toxic in the experimental animals than the other sulphonamide derivatives and no serious untoward effects have been reported following the use of soluseptasine.

With a view to determining the safe maximum dose for guinea-pigs and monkeys we injected these animals with varying amounts of the drug by different routes. One monkey of the series, which received 2 c.cm. of the drug

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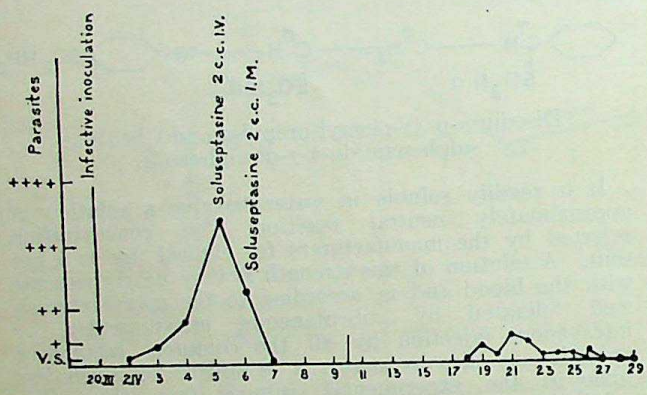
intravenously, was one of those animals which was suffering from low grade infection with *P. knowlesi* and on the day of injection of soluseptasine it showed a fair number of the parasites (both schizonts and gametocytes) in the blood, but 24 hours after the injection no parasites could be demonstrated even in thick blood films. The question arose whether the disappearance of the parasites was spontaneous as this is not uncommon in monkeys with chronic infection, or whether it was due to the destructive action of the drug on the plasmodium. In order to discover the cause of this disappearance we took a fresh monkey (not used previously for any experimental work), 4.48 kilogrammes in weight, and inoculated it with 3 c.cm. of monkey blood showing a very scanty infection with *P. knowlesi*. On the fourteenth day after inoculation an examination of the thick blood films revealed a few parasites for the first time. The further progress of the infection and its course after the administration of soluseptasine are shown in the graph. When



Symbols—V. S. = Very scanty parasites detected in thick films.
\+ = up to 1 per cent red cells parasitised.
\+ + = „ 10 „ „ „
\+ + + = „ 30 „ „ „
\+ + + + = „ 50 „ „ „

the parasite count was very high (nearly 40 per cent red cells infected), the monkey developed hæmoglobinuria and looked very ill. At this stage 2 c.cm. of soluseptasine were injected intravenously. Next day the animal looked better. Not only was there a considerable fall in the parasite count but there were also definite degenerative changes in the parasites, characterized by marked chromatolysis and karyorrhexis. The same dose was repeated 24 hours after the initial injection and this was given intramuscularly. No parasites could be found in the blood after the two injections and the monkey soon recovered from the anæmia caused by the severe malarial infection.

Comments.—Napier and Campbell (1932) and Knowles and Das Gupta (1932) have shown that *P. knowlesi* produces a very intense and virulent infection in *rhesus* monkeys, causing death of the animal, if untreated. The control of such an infection in the monkey by a drug is,

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SOME OBSERVATIONS CONCERNING THE RECENT TYPHOID EPIDEMIC IN CALCUTTA

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WITH A NOTE ON TYPHOID MYOCARDITIS

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Introduction.—An outbreak of enteric fever recently occurred in Calcutta, and it seems to

(*Continued from previous column*)

therefore, the crucial test of its antimalarial activity. The destructive action of soluseptasine on the plasmodium appears to be exceedingly powerful. One injection was sufficient to check a very severe infection and after the second the parasites disappeared altogether from the peripheral circulation. In their studies on the action of atebrin on *P. knowlesi*, the present authors (Chopra and Das Gupta, 1933) have pointed out that it exerts a very powerful action on the parasite. These observers have also noted that after treatment with atebrin the parasites almost invariably reappeared in 10 to 15 days and multiplied with the same rapidity as in the primary attack, causing the death of the animal, if prompt treatment were not accorded. It is evident from the graph that in the case of soluseptasine the parasites reappeared after 12 days in small numbers, a low grade infection persisted for some time, and eventually disappeared altogether without any treatment. We should not, however, like to attach much importance to this point before we have carried out further experiments. It may be mentioned in this connection that recently Dr. Díaz de León (1937) treated 15 cases of human malaria (benign tertian) with Rubiazol*, with satisfactory results. In view of Dr. León's experience in *P. vivax* infection and our results with monkey malaria it may be stated with certainty that sulphonamide compounds are effective specific drugs for malaria.

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* Rubiazol is the French name of one of the sulphonamide preparations.

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us that it will serve a useful purpose if we place on record the clinical picture presented by the patients who were admitted to, and treated in, the Presidency General Hospital.

Let us state at the outset that we are not concerned with the cause of the outbreak, for that has been investigated by the proper authority. However, the great majority of the cases admitted to the Presidency General Hospital came from one building; as the same organism was isolated from nearly all the cases, and as the course of the disease was identical in almost all the cases, it would point to the fact that a carrier was to blame.

The epidemic, if one may call it that, was short but virulent. In all, some 31 cases were admitted to the hospital, and all were of the 'private-room' class of patient. To our minds one of the great lessons to be learned from this outbreak is the value of prophylactic inoculation; only five patients out of the 31 had ever been inoculated. Though the stool, Widal, or other examinations of these five showed that they had been attacked by the same organism as the other cases, yet the course of the disease in these five was short and mildly toxic, severe symptoms did not appear, and convalescence was comparatively rapid.

We would urge all medical men to impress and keep on impressing on their patients the extreme value of prophylactic inoculation in enteric and other diseases, but especially in enteric. If this report should do nothing else but bring this point home, we feel it will have served a purpose.

The clinical picture.—The onset of the disease in the great majority of the cases was strikingly atypical, as it was ushered in with suddenness, a high temperature (103° to 104.8°F.), intense headache, pains in the joints and limbs, and in a few cases with rigors. This onset is misleading and any doctor when called to see such a case would quite naturally consider at the outset that he was dealing with dengue, malaria, or some such condition. As already stated those patients who had been inoculated ran a very mild course, and can now be dismissed from this report, so that the remainder of our observations applies to the non-inoculated cases only.

These cases earlier on displayed an intense degree of toxæmia. Headaches were very severe from the start, as also was sweating. An extreme degree of abdominal distension was a marked feature, and delirium and unconsciousness also made an early appearance and lasted a long while. Some of the patients had meningeal symptoms, and lung complications occurred in others. Bowel hæmorrhages occurred in only two cases and both these patients died. The patients were so ill that special nurses were utilized night and day for every one who could afford them.

The severe symptoms lasted for an average of about 25 days, the shortest being 10 days, and the longest 5 weeks. Only three patients died, the two bowel hæmorrhage cases mentioned above, and one who developed lung complications.

Bacteriology.—The *Bacillus typhosus* was shown to be the causative organism in nearly every case, either as a result of the Widal test, or isolation from the stools, urine, or blood. It is an interesting point that in two cases *B. typhosus* was grown in blood culture 6 weeks after the commencement of the disease. In three of our cases, however, the Widal was 'negative' throughout and in two others in which it was positive at first to *B. typhosus*, 1 in 83, it showed no rise in titre as the disease progressed; yet all these five were definitely clinically enteric.

Treatment.—In addition to the usual orthodox treatment of enteric, the severe symptoms mentioned had to be dealt with as they arose. It was found that aspirin was not effective in relieving the headaches, and of course it increased the sweating, so novalgin or gardan were used for the headaches and joint pains. A daily enema was administered and in the cases where the abdominal distension was great a flatus tube was passed every evening as well, and more frequently if necessary. In all these cases of severe distension of the gut, pragmolin, 1 c.cm., or acetylcholine was given with the enema or the passing of the flatus tube.

Our observations on this method of treating the distension led us to be emphatic on its very great value. We had not seen this mentioned in the literature on enteric, and it was tried as an experiment. The results exceeded our expectations, and the relief afforded to the patient was great.

Luminal, usually in doses of 1½ grain tablets, was our sheet-anchor in those cases which displayed cerebral irritation, and for these it was used unstintingly.

Stypven, morphia and cotarnine were used in the cases of bowel hæmorrhage, but the bleeding was too severe for any drug to be efficacious. Eight cases developed lung complications with extreme cyanosis. All these cases were very ill indeed and for them the continuous administration of oxygen was begun as soon as the affection of the lungs became apparent. The oxygen was given in most of the cases by means of the nasal catheter which on the whole was well tolerated. For two of the cases, however, a modification of Poulton's oxygen tent was rigged up. From our observations of these cases, as well as previous ones, we are convinced of the great value of continuous oxygen therapy in all cases where lung oxygenation of the blood is lessened, either from a pure pneumonia, or in complications of a toxæmia from other diseases.

In our opinion the giving of continuous oxygen by the in-dwelling nasal catheter is good enough for all practical purposes, at any rate in India where financial stringency prohibits, in the vast majority of hospitals, the

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purchase of an oxygen tent. We would stress however that the administration of the oxygen *must be continuous* (there is very little use in giving it for 10 minutes every hour), and a nurse or attendant must be constantly with the patient. Oxygen given by means of a glass funnel held in front of the patient's mouth and nose is completely useless. The various forms of oxygen tents of course give the best treatment, but they are all fairly expensive. Some of them, such as Poulton's, are comparatively simple; others are, in our opinion, too complicated for use in India. We believe that with a little ingenuity it is possible to rig up a satisfactory tent.

Diet.—The dieting of these patients presented no difficulty, for the seriously ill patients were unable to take anything but whey, sips of glucose water, and honey. As they got better the diet was rapidly but gradually increased up to a full 'milk diet' (*i.e.*, milk, milk foods, eggs, puddings, jellies, bread and butter). The first increase from the whey and glucose water was citrated milk, and then a gradual increase up to the full milk diet was permitted, and in some cases this was reached before the temperature settled to normal. All the patients except those with cerebral irritation took their nourishment well.

The writers' enteric patients are all ordered 'milk diet' on admission, and then when seen they may be permitted the 'full milk diet', or a modification of it is made to suit each individual patient according to his condition. Thus, a mild enteric, especially of the *para* group, may be on a full milk diet from the moment of his admission. We have never seen any ill effects from judicious feeding of enterics, but on the contrary are convinced that the feeding is beneficial, and lessens the weakness of convalescence and the risk of complications.

Complications.—One of our cases, a boy 9 years old, was already so ill that it seemed impossible that he could recover, when one morning an ulcer in his gut perforated. The abdomen was opened, and the perforation repaired; the abdomen was partially sutured and a large drainage opening left. However, the toxæmia was so great that, on the fifth morning after operation, the wound completely broke down and most of his intestine came out into the bed. The condition then seemed hopeless, especially as the child was suffering from severe shock, and was collapsed and pulseless. The intestine was heaped back into the abdomen, and covered over with a drum towel saturated with normal saline, and the patient was put into a corset and binder. The towel was remoistened every two hours, and completely changed every 12 hours. The patient was kept quiet. He is now completely well, the wound has healed over, and he is waiting for a metal protector before leaving for his home.

During convalescence we observed that all these patients showed some degree of myocarditis and anæmia. Splenic and liver enlargement were not marked features. Convalescence was treated with strychnine and the other usual tonics, and one or other of the liver extract preparations was extensively used, with, we feel, good results, but not having any control cases we must not be dogmatic.

We have not appended any tables or statistics for the number of our cases is too few, so we have considered that a narrative description would be of more interest.

Our thanks are due to Dr. C. D. Torpy, I.M.D., the Hospital Registrar, for searching through the various history sheets for us.

TYPHOID MYOCARDITIS

European and American authorities nowadays regard circulatory failure in typhoid fever as predominantly of peripheral and not of cardiac origin; otherwise stated by White, 'generally the heart is not affected to any important or appreciable degree in typhoid fever'. Many of us in India, however, in the light of our more frequent experience of the disease, incline to the opinion that the central contribution to circulatory failure afforded by myocardial weakness, and often manifest about the middle course of typhoid fever, is not quite so inconsiderable as our distinguished confrères would have it. We courteously suggest that the myocardial pathology of typhoid fever has been a trifle hastily interpreted by modern thought, which too abruptly dismisses as merely a sign of rapid post-mortem decomposition the toxigenically soft and swollen or flabby heart of the clinical pathologists of former days. Furthermore, it is difficult to conceive any severe grade of peripheral failure without corresponding impairment of the coronary circulation and consequent myocardial weakness. At all events we think that more extensive electrocardiographic study of the heart in typhoid will probably support our more tolerant clinical concept of circulatory failure in this disease.

The difficulties inherent in the discovery and demonstration of typhoid myocarditis by ordinary clinical methods are expectedly manifold. The previous myocardial state is generally an unknown quantity. The complications of typhoid, and more especially those of abdominal origin, focus our attention elsewhere than on the heart. But most disturbing of all is the knowledge that those signs upon which we used to rely so faithfully—namely, feeble pulse, rapid heart rate, distant heart sounds and even fœtal heart sounds—may all likewise document circulatory failure of peripheral genesis. Accordingly, although we shall omit the usual description of the changes undergone by the apical first sound and proceed at once to mention some of the more direct bedside evidence of typhoid

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MALARIA IN RELATION TO THE COASTAL LAGOONS OF BENGAL AND ORISSA

By C. STRICKLAND, M.A., M.D.
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CHANGES in level of the currents of water that flow on the Earth's surface are of course an everyday phenomenon: the streams at a comparatively high level being described as 'in flood', and the antithetic condition 'low-water', or 'at the ebb'. Now it is well known, at any rate in deltaic lands, that along a certain line between the margin of the flood and that of the stream at low-water—and this is true whether the current be a sea-current or the flow of a river—a relatively high bank of sediment settles down, and it is such banks on either side that confine the river at low-water. The channel so formed by this disposition is ordinarily regarded as all that 'the river' is, whereas it would be more correct to look upon the uttermost and vaguer limits set to the margins of the current while it is in flood as demarcating 'the river', the stream when more clearly limited by the banks of sediment referred to being only its low-water phase.

During this phase, it must now be mentioned, there remains behind the bank a residuum of the flood-level water known as a *lagoon**.

Now whether one be by the sea-coast on the one hand, or by the courses of the rivers in the uplands or paradelta on the other, this moulding of the land may be observed. In the hills, the streams in flood stretch from scarp to scarp of the old rocks that confine them; but at their low-water or 'fair-weather' flow their channels lie between banks of deposit behind which are shallow sheets of water, that are sometimes called 'lateral lakes', and they are *homologous in every respect to the lagoons of shallow water in the delta.*

It is only, however, the formation of the lagoons at or near the sea-coast that will be here considered, and again it must be remarked that they are characteristically shallow expanses of water shut off at times of low-water from the river, or sea-currents, by a bank, while they are flooded over at the times of high-water.

The secular history also of such a lagoon may be here recounted. Originating from an expanse of water which is at no time shut off from the sea or estuary, as far as one can see at the surface, it is only a later circumstance that the bank of sediment, that has been gradually laid down along a wayside current, appears above the surface of the water and separates off what is now the lagoon. Coral growing on a ring bank and an atoll forming is the manifestation of an exactly homologous phenomenon. Gradually the lagoon silts up, relatively to the surrounding land, and so becomes ever shallower and less often or less extensively inundated by the floods. The silt that effects this transformation is carried into the lagoon by the surrounding waters when in flood and it is deposited as the waters recede, as also—and this factor is perhaps not sufficiently appreciated—by wind-blown material, for in the vicinity of the sea-coast it can readily be realized that this is a circumstance to be reckoned with. Meanwhile as the lagoon becomes shallower and shallower it becomes relatively less brackish, and more and more sweet-water plants invade it and cover its surface.

Along a sea-coast the nascent formation of lagoons is represented by the series of parallel gutters and sand-banks between the beach and the open sea. This parallel formation is a consequence of the fact that wind-waves of the open sea, whatever be their direction, gradually become parallel with the coast as they run on shore, owing to the greater drag exercised by the bottom as the water shallows. The water-currents for the same reason assume a direction parallel with the line of the shore, and just as a river-current elevates a bank the summit of

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(*Continued from previous page*)

myocarditis, we at the same time assert that such heart-sound changes are in part at least early expressions of myocardial failure.

The development of cardiac dilatation during the course of typhoid fever is primary evidence of acute myocarditis. It is displayed by an outward movement beyond the left mid-clavicular line of a wavy cardiac impulse with corresponding shift of the left border of cardiac dullness. Provided, firstly, that the diaphragm is not displaced unduly upwards by the commonly prevailing meteorism and, secondly, that we exclude organic valvular disease, hypertension and coronary disease, the appearance of such dilatation clearly proclaims the presence of acute myocarditis. The most emphatic auscultatory sign is succinctly given by gallop rhythm, which in our experience may often be foretold at an earlier phase by so-called impurity or splitting of the first heart sound. It may be interesting and profitable to note that, quite apart from typhoid myocarditis and circulatory failure in acute infections, gallop rhythm is now recognized as an outstanding, facile and often early sign of the failing arteriosclerotic or hypertensive heart, which is by far the commonest type of failing heart encountered in India. Dilatation of the typhoid heart, however, is most usually announced to the unwary observer by the development of an apical systolic murmur which rarely fails to evoke an immediate diagnosis of some sort of myocarditis or endocarditis, and a suitable sense of auscultatory pride and satisfactory accomplishment.

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* The reason why there is a residuum of the flood is explained by the writer in a paper *Holland and Bengal, vide* Transactions of the Royal Society of Tropical Medicine and Hygiene, 1938 (in the press).

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which follows a line somewhere between its low-water margin and its high-water limits, behind which bank is the lagoon, so do the sea-currents throw down a series of sand-banks between which and the 'sea-beach' are gutters of comparatively placid water, the beginnings of lagoons, which are beautifully shown in map 1. In the course of time such a sea-bank is raised to a level at which it remains above the sea for comparatively long periods and meanwhile it becomes consolidated by the cementing action of the water and by the growth of plants, and derives accession of wind-borne material.

If the sea-waves only should hold sway, the lagoon might be wholly continuous along the sea-coast, and there would not be any cloaca (*see* map 1) in the seaward sand-bank, but the rivers draining the hinterland and passing through the lagoon have to find an outlet to the sea, and in doing so they build up the inevitable bank of sediment, as described above, and tend to separate off their channels from the lagoon, incidentally retaining a passage through the sea-bank for the passage of their waters. Before, however, the rivers crossing a lagoon demarcate themselves their waters mingle with those of the lagoon, finally finding an outlet through the sea-bank, and when the river has demarcated itself there always remains in the river-bank a passage for flooding the lagoon over a low bank exposed in the fair-weather.

The Chilka Lake in Orissa (*see* map 1) illustrates these points on a grand scale. Here the sea-currents have laid down a bank of sand that would be completely continuous if it were not that the fresh waters brought into the lake by the Daya, Bhargavi, and other rivers provide a potential head for keeping a small and shallow channel scoured out through the seaward bank. They have not as yet demarcated a channel for themselves thus occluding the rest of the lagoon. The tendency is always for the sea to form a continuous bank and repair any breaches in it, but the opposing rivers must prevail to a greater or less extent—to a greater when they are in flood, to a less in the fair-weather. When the rivers during the rainy season are in flood the waters widen the exit through the sea-wall and then they press back the sea and as they prevail the lagoon becomes ever sweeter, whereas when the rivers are at their fair-weather flow the sea prevails and the waters of the lagoon become more brackish, although at the same time the sea-bank is to some extent repaired by the sea.

There is at Chatrapur (*see* map 2) an example of a lagoon or *tempara*, as in Orissa it is called, shut off nearly completely from a river, the Rushikuliya, that floods and drains the *tempara*, a river that doubtless once flowed through it at all times as does the Bhargavi now through the Chilka Lake. Seaward it is completely limited by a sea-bank or sand dune (*see* plate VII, figures 1 and 1*a*).

The persistence of the lagoon-structure continuously right along the coastal belt of Bengal

MAP 1

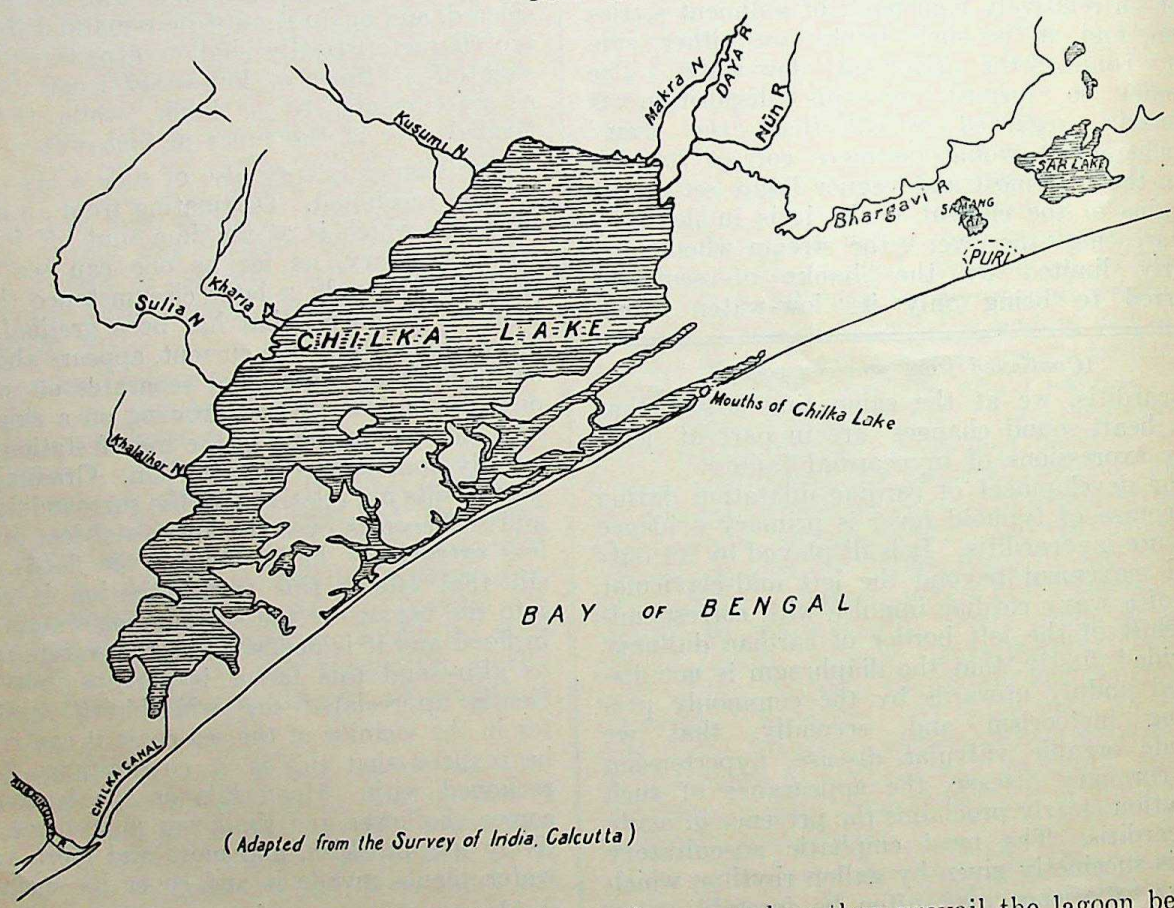

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Fig. 1.

Fig. 1*a*.

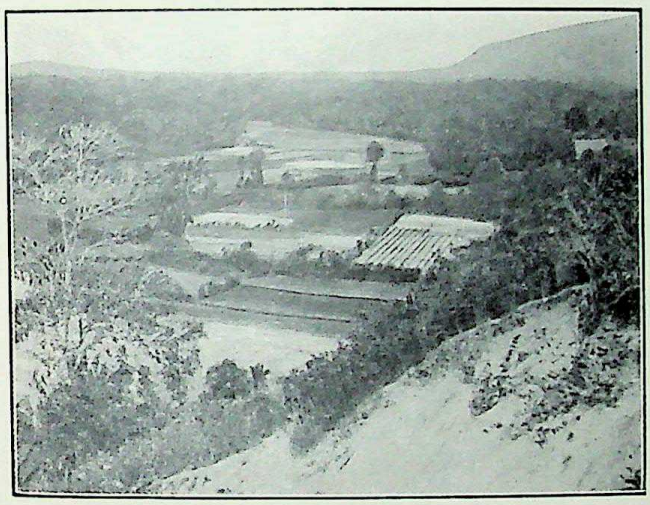

Fig. 2.

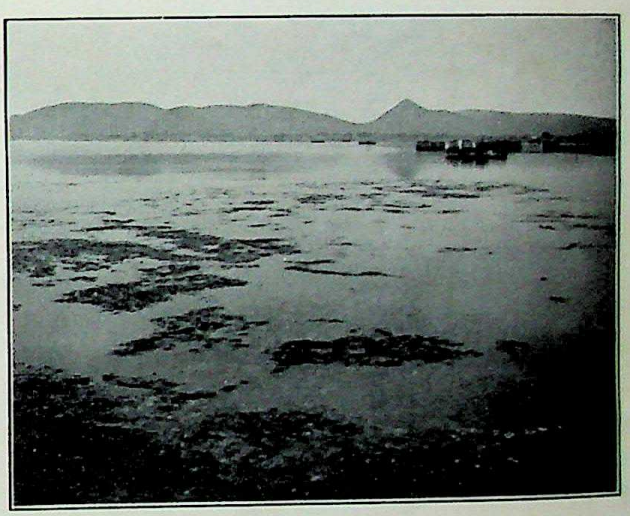

Fig. 3.

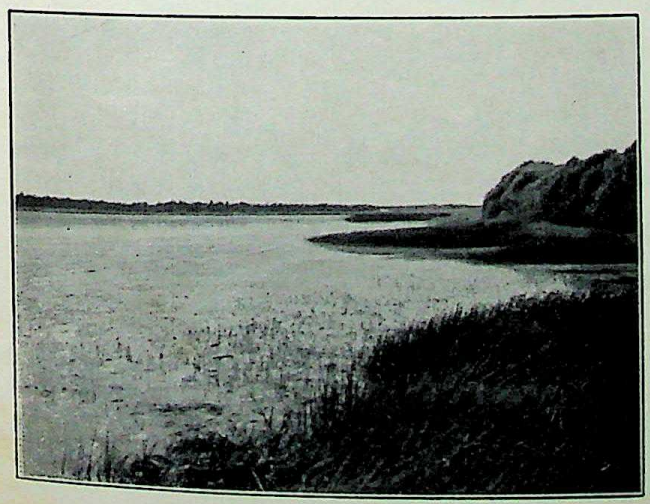

Fig. 4.

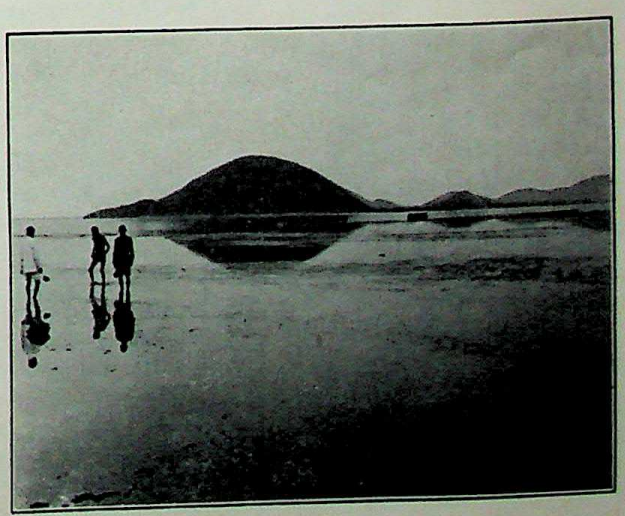

Fig. 4*a*.

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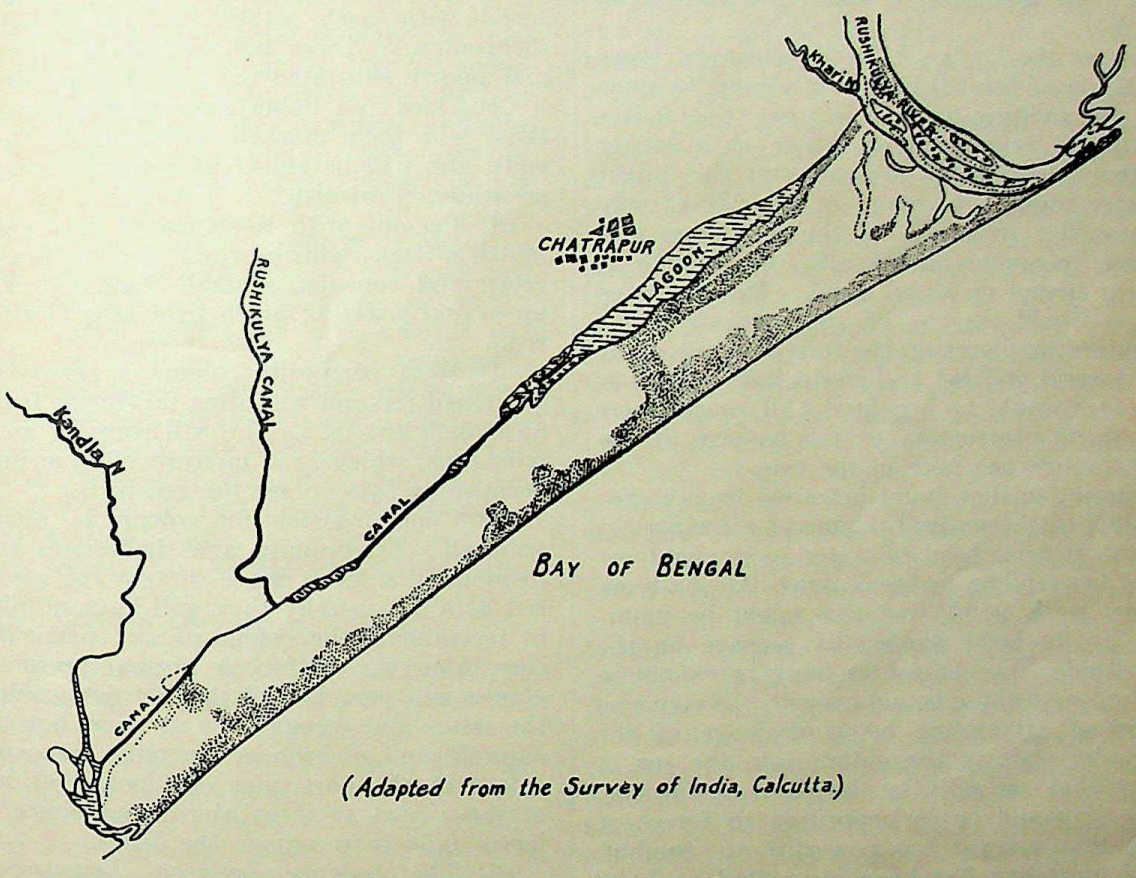
and Orissa, of which a section is shown in map 2, indeed made feasible the building of the Orissa Coast Canal, along an endless chain of *temparas*, while their feeders, the great rivers that crossed the lagoons and shut them off, have made water available for the canal.

The *temparas* are not reproduced in any such striking way at the Bengal sea-face, and probably this is due to the fact that here the littoral drift is of a finer material than in Orissa. However, in the Contai sub-division of Midnapore district there are the vestiges of such tracts; for instance, there is a small *tempara* at Jinput, and at Fraserganj on the south of the district of the 24-Pergannas there are also some such formations.

With regard to the relationship of the *temparas* with malaria, the writer has elsewhere pointed out that their homologues in the Bengal Sunderbans are non-malarious, but on the coast at Fraserganj (*see* map) the *rayats** showed a 25 per cent spleen index, and *Anopheles ludlowi* was captured here. This was in marked contrast with the very low spleen index in the immediate hinterland.

In lower Bengal in general one may say that if the basins of the *dwips* that represent the lagoons are protected from the ingress of flood-water from the rivers they are non-malariagenic, while on the sea-coast where grassy sandy maidans abound with intervening swamps that are not bunded, and carry *Anopheles ludlowi*,

MAP 2



(Adapted from the Survey of India, Calcutta.)

In the deltaic Bengal Sunderbans the relatively low-lying area in a *dwip*, as the naturally-formed island is named, is called a *bhil* and this is characterized by a comparative lack of tree-growth, so that in the hot weather its surface becomes sun-dried mud. In Malaya, along or near the coast, sand-banks may be found here and there and are called *permatang*, which are usually grassy 'maidans', as in Bengal, while in that country too it is interesting to note that a place called Singarang in Johore State occupies the site of an old *tempara*, and *singaram* is an alternative Kling name for the *tempara* of Orissa. Also at Batu Burok in Tringganu State (*see* plate VII, figure 2) there is a similar old lagoon silted up and now intensively cultivated. the people suffer from malaria. At Jinput near Contai outside the great sea-dyke a few poor people living beside a small *tempara* eke out a scanty existence. The children who were available for examination here were only seven in number but every one had splenomegaly, while inside the great sea-dyke where the water is sweet enough for the cultivation of *padi*, the spleen-index was under 5 per cent.

It is exactly the same in Orissa; one has the coastal brackish water *tempara* represented on a great scale by the Chilka Lake, and the sweet-water inland *tempara* now silted up and planted with *dalua padi* as at the Samang Pat (*see*

* Cultivators.

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map 1) behind Puri, the one intensely malarious, the other practically free from malaria.

The indication of these observations would seem to be the closure of the basins as far as possible, only allowing to accumulate the fresh sweet water entering them from the hinterland. In deltaic Bengal, the garden of aquatic vegetation growing on the surface of the waters collecting in the natural basins does not appear to conduce to malaria, and if the *tempara* be closed, it is probable that the shallow sweet water supporting a garden of aquatic vegetation would not breed malaria-carrying mosquitoes as it does now (plate VII, figure 3). It is probable that it is the close embankment of the *dwips* of Bengal that has saved its people from malaria, though of course they would not be there if they had not embanked their land, for it would not have been habitable.

As far as the Chilka Lake is concerned there would be an additional benefit of closing to some extent its existing outlet, in that the feeder rivers would remain under water at a higher level than they do at present, and this might have the added advantage of providing more water for the irrigation of the *rabi* crops. In this case economics and health would seem to be closer bound up than usual. The proposed measure would drown the shallow-water mosquito-breeding places on the foreshore (*see* plate VII, figures 4 and 4*a*) and pisciculture as well as agriculture would be benefited. Of course there must be no obstruction to the passage of the rivers through the lake in the rains.

An objection that might be raised from a consideration of the natural régime of a *tempara* is that an artificial head of water in it might set up a stress tending to break down the sea-bank at some weak point, and this might be manifested by its being sapped by seepage on the seaward side. The difficulties, however, cannot be compared with those bound up with the converse measure of attempting better drainage of the country by opening the outlets into the sea, a measure that can only be described as fatuous, because it would be in opposition to forces of Nature that are far too powerful to combat. Such a procedure has been attempted at Lake Sar (*see* map 1) with ill success.

Apart, however, from any interference with the levels of the waters in the Chilka Lake, or any other *tempara*, the foreshore which is a prolific breeding place of the mosquito might be warped by one method or another. The best would seem to be by the growth of mangroves, or other plant life such as the *nal* reed, both of which have an economic value, and probably have both been cleared away in the past, just as is a corn-field by a swarm of locusts. Otherwise warping should be resorted to by physical means such as groynes or baffles of some sort or other.

To do anything at all to alter the *status quo* is in a sense to combat Nature and her agent

(*Continued at foot of next column*)

COLOUR PERCEPTION, AND COLOUR-BLINDNESS TESTS

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THIS paper is a short study of colour-blind persons, and the relation of their colour perception, as shown by the spectrometer, to the answers given by them when examined by the Edridge Green lantern and Ishihara's tests.

For practical purposes a person may be said to be colour-blind, if he is a trichromic, dichromic, or has a marked shortening of the red end of his spectrum. Persons in these three categories exhibit the following peculiarities :—

(1) Red, green, yellow and white lights owing to their common property of brightness are confused with each other by trichromics and dichromics, if these lights happen to be bright and poorly saturated or dimmer than usual.

(2) Dark red lights are often not seen by those who have marked shortening of their red ends, and will be called black and no light and occasionally whitish.

(3) Persons with a shortened red end will match a dark reddish-brown wool with a darker green and consider a small dark-red light as green and a darker green light (signal green) as red.

(4) With composite colours a person with a shortened red end will often fail to see the colour he is deficient in, *i.e.*, he will consider as blue a pale pink which is a mixture of blue and red, because he fails to see the red in it.

(5) Central vision for colour is more pronounced. Trichromics and dichromics will fail to identify a letter made up, say, of a series of red dots but usually they will have no difficulty in recognizing the colour of any particular dot composing the letter. A normal person at a glance will perceive all the red dots making up the letter and recognize it at once, but the trichromic and dichromic can only make out the colour of the particular dot looked at but not of those next to it or above and below it and hence fails to recognize the letter.

(6) The balance between brightness and saturation, on which the correct interpretation of colour appears to depend, seems to be interfered with, particularly if there is any shortening of the spectrum. If the balance is upset, and the sense of saturation for reds and violets is diminished and they are paler than what appears to the normal person, brightness not saturation gains the upper hand and reds are mistaken for yellows, blues for violets giving

(*Continued from previous column*)

Man, so one comes down to a choice of the measures that will encounter least opposition and will involve least difficulty. Closing up the *tempara* to a certain extent would seem to be such a measure.

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rise to the so-called increased yellow and blue sensation. There is not an actual increase in sensation; these colours merely appear bright. If red, yellow, yellow-green, blue and violet dots are mixed up together figures made of red or green colours are not distinguished from the other colours which form the background, particularly if viewed in a bright natural light, but the figures may be recognized by the same person if the examination is carried out in the subdued light of a room, or if the figures are viewed by artificial light. This points to the influence of brightness over colours and helps to explain the variations which may occur with different examiners.

(7) Colour-blind persons do not guess. They answer strictly in accordance with their colour perception. A couple of examples can prove this point :—

(*a*) Light red (red B) and orange are frequently called red by dichromics. Add a modifier (neutral one) and they will very often be called green. Remove the modifier and the original answer will be given. This can be repeated over and over again. This is not guessing.

(*b*) A case of mine, a trichromic, almost a dichromic and with a shortened red end saw light green as red and signal green as green. When a modifier (neutral one) was added and the brightness effect caused by the yellow in the light green was toned down, it was called green, and the signal green (dark blue-green light) was called red, because it now was much darker and he had a shortened red end. When the modifier was removed the original answers were given. This was repeated again and again and for several consecutive days. He was not guessing.

Dr. Edridge Green's spectrometer

This spectrometer is provided with right and left hand shutters. The method of examination is as follows :—

(*i*) Different regions of the spectrum are exposed between the shutters.

(*ii*) The red end is ascertained by moving the left hand shutter to the right. If there is a shortening a strip of spectrum distinctly red will be called black or grey.

(*iii*) The fullest extent of red is now ascertained by moving this shutter to the left, and when orange appears the right hand shutter is slid across to the orange border and the left hand shutter moved to the left until yellow appears. In this way the whole spectrum can be traversed. Both shutters are now drawn to the ends of the spectrum and the following will be noted :—

(*a*) The number of colours that can be observed: According to Dr. Edridge Green the number of colours to be observed vary from 7 to nil. Both extremes are very rare. More commonly 6 and 5 colours are noticed, red, orange or yellow, green, blue and violet, then 4, red, yellow, green and violet, 3, red, green and violet, 2, red and violet (or yellow and blue). I believe 10 to 15 per cent of people can see only 3 or 2 colours. A white area in the place where green should be is sometimes seen by dichromics and varies in extent from a strip to nearly the whole length of the spectrum. There is sometimes no white area.

(*b*) *Brightness of the spectrum.*—The spectrum particularly if very brightly illuminated will appear at first to be uniformly bright but if a moderately bright spectrum is closely observed two areas can be noted, one a very bright area made up chiefly of orange and yellow with narrow strips of pale red and yellow green —this I call the area of most intense brightness; it will be noted that the colours in this area are not very saturated, *i.e.*, are pale reds and greens and the other a larger area of brightness which extends from the junction of the dark and bright red to the blue and contains saturated colours. Now, the reason why colour-blind persons mix up red, green, yellow and white lights with each other is because of their common property of brightness, it will naturally be supposed that this defect should first appear where the brightness in the spectrum is most marked, and this is actually what happens. The trichromic, when mapping out the spectrum in the manner indicated, will map out and call yellow a narrow area more or less corresponding to the area of most intensive brightness and consider this area absolutely monochromatic. He may also call it white. As this area contains poorly saturated pale red, orange (reddish) yellow and yellow-green (greenish) colours, he will with a lantern test mix up pale red, orange (reddish) yellow and yellow-green (greenish) lights, because these colours more or less correspond to the colours in his monochromatic area, but he will not make mistakes with saturated reds or greens (unless modified), because they are not within this area. With the dichromic there is merely an extension of this defect. When mapping out red he will draw the left hand shutter beyond the blue-green junction and declare the whole of this area to be red or yellow. In a very few instances he will call it white or green. This area corresponds to the larger area of brightness and since it contains saturated reds and greens will with a lantern examination mix up these colours. This behaviour to me proves beyond question that differences in brightness are responsible for the mistakes that are made by the colour blind. As regards the zones of brightness, it is a common experience to have trichromics of increasing degrees of trichromatism map out monochromatic areas from just a narrow strip in the orange-yellow area, to an extent which is almost dichromic, and their behaviour with the lantern tests has corresponded. As regards the larger area of brightness it is difficult to define exactly where it shades on the left. The dichromic usually stops at the blue-green junction, I suppose, because he recognizes blue,

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but a number of dichromics I have questioned when asked what they consider was the largest area of brightness said it ended at the commencement of blue.

Edridge Green lantern.—The coloured glasses in the Edridge Green lantern are carefully picked and approximate as closely as possible to the colours of the spectrum. The dark red (red A) resembles the dark red of the spectrum and, therefore, if there is a shortened spectrum this red will not be seen nor appear as black or grey, particularly if a modifier is used as well. On the spectrum, dichromics will sometimes see the dark red as green. Therefore they will also sometimes see red A as green, when given a lantern test. The bright red (red B) comes within the greater area of brightness and, hence, will be called either yellow or red and sometimes green or white by dichromics, but trichromics will not make mistakes unless a modifier is used. The orange-yellow and yellow-green colours are similar to the same colours seen on the spectrum, and, as these colours come within the area of most intensive brightness, they are often confused with each other by other trichromics when viewed through the small apertures of the Edridge Green lantern, but generally they are recognized if seen through the large diameters, unless modifiers are used. They are invariably mistaken by dichromics, even when large diameters are used. The yellow-green light is considered to be red because :

(*a*) it is within the larger area of brightness which is either yellow or red to dichromics, and

(*b*) the yellow in the green is seen as red. A normal person will call this colour a yellow-green or a greenish-yellow light, because he perceives the yellow in it. It follows that a colour-blind person, who sees no green and to whom yellows are red, will call it red. Orange and yellow lights may be called red or white, but are often called green, particularly if a modifier is used.

The Ishihara test

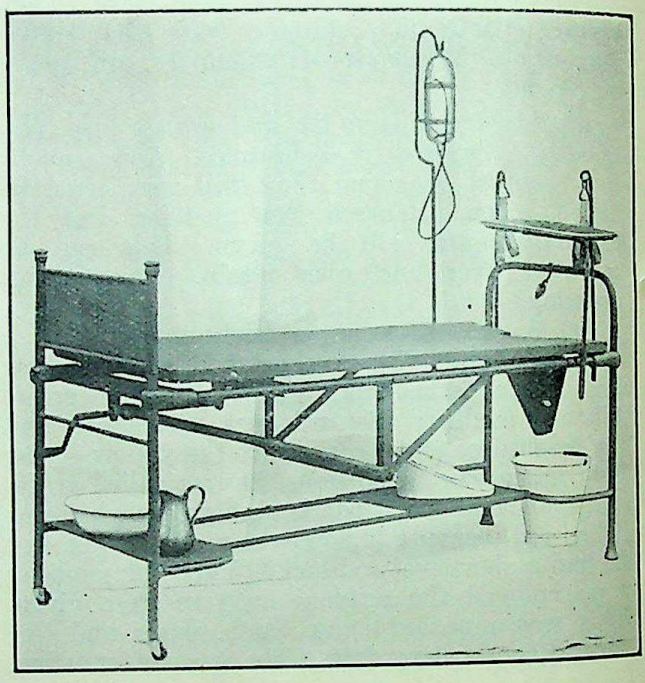
This embodies more or less all the points observed in colour-blind persons and particularly allows for the altered state of the spectrum with regard to brightness and saturation resulting in monochromatic areas and consequent inability of colour-blind persons to recognize colours which occur in the monochromatic areas of the spectrum and which are therefore liable to be confused with each other. Plates 6, 7, 8 and 9 and the numerals thereon are made up of unsaturated colours which appear in the monochromatic areas and in consequence the red and green numerals are not picked out from the surrounding colours. It should be noted that failure to see the numerals 6 and 2 in figures 12 and 13 is not due to the fact that he cannot see green, but that he has a shortened spectrum, because the lower you go in the scale of colour

(*Continued at foot of next column*)

AN OBSTETRIC COT

By W. C. SPACKMAN
LIEUTENANT-COLONEL, I.M.S.
Professor of Midwifery and Gynæcology and Senior Specialist in Obstetrics with Gynæcology, Bai Motlibai and Sir D. M. Petit Hospitals, Bombay

THE bed illustrated herein has been designed at the Bai Motlibai Hospital as suitable for labour purposes in hospital and maternity home practice. We had felt the need for an improvement on the type of maternity bed in common use, which was usually a hard plank bed of plain design.



The special features displayed by this bed are—

1. The *med* top or mattress :

(*a*) So as to have no obstruction at the foot-end to the surgeon or the nurse; the raising or lowering device for the top is operated from the head-end instead of from the foot-end as in other makes.

(*Continued from previous column*)

perception, the more frequently do defects in light perception appear, and their presence is only strongly suggestive of dichromatism on account of their frequent association with it. Examinations should be carried out in bright naturally-lighted rooms, otherwise mistakes may be made and variations observed in the same person examined with the same book.

I would like to express my thanks to Dr. Edridge Green for his courtesy and assistance; whatever little I have learnt on the subject of colour perception is due entirely to my using his spectrometer, lantern, beads and book tests, and to the encouragement he gave me.

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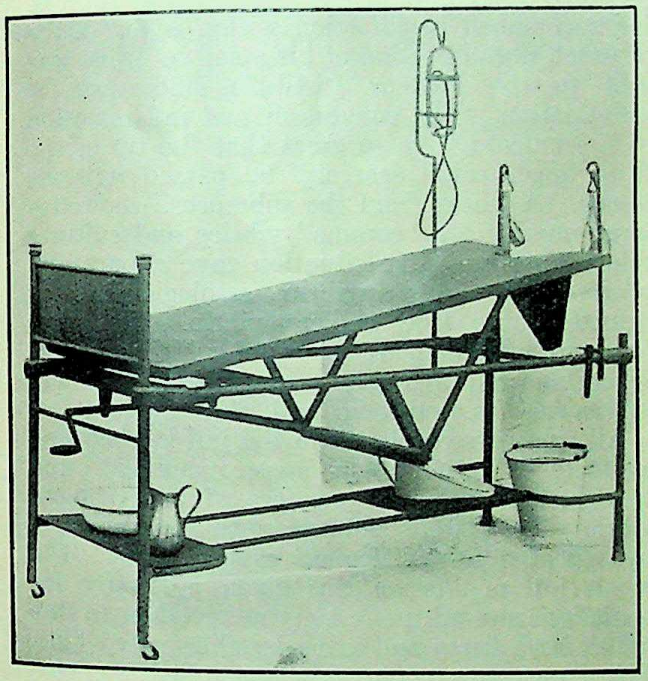
(*b*) In cases of collapse and to facilitate manipulation in the lithotomy position the foot-end can be raised to any desired angle—movements being almost unperceived by the patient.

(*c*) The 'U-shaped' recess at the foot-end assists draining and gives good access when a patient is in the lithotomy position. This also makes application of forceps particularly easy.

(*d*) The top is slightly curved along the central line and slopes towards the foot-end, facilitating easy drainage into the douching shoot at the foot-end.

2. Removal of foot-end bow, which permits full access to patient in lithotomy position by the use of removable side crutches.



3. Both the head-rest and the foot-end bow are detachable to form a plain table.

4. Detachable tray-stand at foot-end for instruments, cord ligatures, swabs, etc.

5. Detachable douche-can carrier.

6. Pulley on foot bar for applying weight-traction.

7. Tray under the bed (foot-end) for bed-pan, keeping this clear of the floor.

8. Tray under the bed, head-end, for container for dressings, pads, etc.

This bed has been made for us by Messrs. Nanus Brass Works, Bombay, and was designed by Dr. K. A. Nulkar, M.D. (Bom.), B.M.S., and myself. Such beds have been in use here for a year and have proved very satisfactory.

VIBRIO CHOLERÆ FROM MATERIAL OBTAINED BY LIVER PUNCTURE DURING LIFE

By C. L. PASRICHA
MAJOR, I.M.S.
A. J. H. DEMONTE, I.M.D.
and
B. C. CHATTERJEE, M.B., D.P.H., D.T.M.
(*From the Bowel Disease Research Department, School of Tropical Medicine, Calcutta*)

ALTHOUGH *Vibrio cholerœ* has been recovered from many organs at post-mortem examination, we are not aware of any records of the finding of this organism from sources other than the stools, vomit, or urine of cholera patients during life. In the case recorded in this paper vibrios were recovered from material obtained by liver puncture performed during the acute stage of the disease. A brief summary of the clinical history of the patient and the characters of the vibrios isolated are given below :—

The patient, a boy aged 7 years, developed cholera with typical symptoms on 30th April, 1938, and was under the care of one of us (B. C. C.). *V. cholerœ* was isolated on the first day of the disease. The usual treatment for cholera was given and the patient progressed satisfactorily till the morning of the third day when he complained of pain in the right side of the abdomen. There was an icteroid tinge in the conjunctivæ and on examination there was found a hard tender mass extending to the level of the umbilicus, continuous with the liver dullness. The icterus increased and towards the evening of the same day the jaundice became generalized and the condition of the patient became unsatisfactory. During the next three days the patient's general condition remained unchanged. On the seventh day he became much worse, the jaundice more intense and the liver dullness extended to below the umbilicus. A fine needle was inserted into the enlarged liver below the costal margin in the anterior axillary line and a few drops of blood withdrawn. This was immediately inoculated into peptone water. The next day the patient was much better, the jaundice and pain less and the liver enlargement decreased. Convalescence was slow but uninterrupted. The patient was well in about 14 days.

Typical O-agglutinable vibrios were isolated from the stools collected on the first, second, seventh and ninth days of the disease. The vibrios isolated from the material obtained from the liver puncture were O-agglutinable smooth *V. cholerœ*, indistinguishable in their biochemical, serological and bacteriophagic reactions from the vibrios isolated from the stools. Vibrios were not found from samples of blood and urine collected from this patient. The van den Bergh's test, done on the ninth day of the disease

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CHOLERA EPIDEMICS IN BURMA AND THE TYPE OF VIBRIO ASSOCIATED WITH THEM

By G. C. MAITRA
LIEUTENANT-COLONEL, I.M.S.
P. N. SEN GUPTA, M.SC.
and
U. THANT, D.T.M.
(*From the Pasteur Institute of Burma*)

CHOLERA has been known to exist in Burma for many years. Its seasonal prevalence was also recognized, as the Burmese word for it—*Kala-Wun-Yoga* (*Kala* = Time, *Wun* = Intestine, *Yoga* = Disease)—literally means periodical intestinal disease. Beyond this very little is known about its ætiology, spread, and control among practitioners of indigenous medicine. A vague belief, however, exists that the disease was first introduced by Indian labourers who came to build pagodas (Buddhist temples) at Pagan. On the other hand, there is every probability that epidemics occasionally spread from southern China where cholera was described by the very name it now bears, over two thousand years before the Christian era (Maxwell, 1929).

A systematic record showing the mortality rate for cholera in Burma (Bozman, 1937) is only obtainable since 1872 after the country had passed under British control. Rogers (1928) refers to this record and, correlating the mortality rate with figures of absolute humidity deduced from various meteorological data, arrived at the conclusion that Lower Burma is 'a typically endemic' area. But there is still some doubt in certain quarters about accepting this view, as frequent reference to importation of cholera from neighbouring provinces by immigrants is found in annual reports of provincial health authorities.

This confusion has been largely due to lack of facilities for investigating outbreaks by modern scientific methods. In a busy port like Rangoon where such facilities exist, the result is vitiated to a great extent by frequent admission of persons from hyperendemic areas in India, some of whom are probably 'carriers', and are capable of starting a fresh outbreak if placed in suitable environments. A striking example of this type of epidemic was first described by Greig (1913) in Puri jail. On this occasion the carrier was a convict who had acquired the disease before imprisonment and recovered from it.

About the middle of July 1936 a small and sharp outbreak of cholera occurred in a big jail within easy reach of Rangoon. This afforded us an excellent opportunity to study the epidemic from beginning to end under controlled conditions. The jail being specially set apart for habitual offenders, the inmates were mostly convicts serving long sentences.

The first case was a prisoner who had been in jail for several months past and as such could not have associated with outsiders or obtained food and drink from outside sources. He succumbed to infection within a few hours of onset, and a portion of his small intestine was sent to the Pasteur Institute laboratory for examination. The congestion and inflammation of the mucosa were so great that the tip of the little finger could scarcely be passed into its lumen. A smear from the submucosa showed a large number of 'comma' vibrios and cultures taken from the same situation gave a pure and profuse growth of a vibrio, serologically confirmed as the true cholera vibrio. This was followed by two more cases, of which one was severe and required saline transfusions. Cholera vibrio was isolated from both the cases.

All prisoners employed in the jail kitchen and contacts of actual cases were examined, and two were detected as carriers of true cholera vibrio. They were isolated until declared free by repeated bacteriological examinations. The whole jail population was given protective inoculation, and adequate steps were taken to disinfect fresh fæces and urine by chlorinated lime. These measures completely controlled the epidemic and no more cases occurred. The outbreak is remarkable in that all reasonable possibilities of importation from outside sources were excluded proving that the disease originated locally and quickly showed a tendency to assume epidemic proportions.

Characters of vibrios isolated from cholera cases in Burma

Since 1935, cultures of vibrio recovered from stools of acute cases have been collected for study as to their detailed characters, particularly to help in selecting suitable strains for preparing vaccine used in preventive inoculation in Burma. Though the majority of strains were isolated from patients admitted into the Contagious Diseases Hospital, Rangoon, a few were also recovered from cases which occurred in the delta area, *e.g.*, Pyapon and Twante. In recent years a vast amount of work has been done by Linton and others (1932–1934) on the chemical

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(*Continued from previous page*)

when the jaundice was intense, gave an indirect positive result and a delayed direct result. This suggested that the jaundice was of the hæmolytic type.

Summary

1. A case of cholera, in which on the third day of the disease there occurred an acute enlargement of the liver with the development of jaundice, is recorded.

2. From the material obtained by puncture of the enlarged liver *Vibrio choleræ* was isolated. This strain was indistinguishable in its biochemical, serological and bacteriophagic reactions from the vibrios found in the patient's stools.

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composition of vibrios, especially with regard to their protein and carbohydrate contents. Owing to obvious limitations in this laboratory we could not go into these details. We concentrated mostly on the biochemical reactions described by Heiberg (1934) and serological reactions with sera raised against stable 'O' antigens of 'Inaba' and 'Ogawa' type cultures. Altogether 56 strains were studied and most of them, when freshly isolated, agglutinated well with 'HO' serum prepared in our laboratory against type cholera vibrios received from the National Collection of Type Cultures. Four were inagglutinable or reacted partially (20 to 25 per cent of the full titre) with the 'HO' serum. All 56 were further titrated with pure 'O' sera. The results of agglutination tests, nitroso-indol reaction and hæmolysin production for sheep cells have been summarized in the following table :—

TABLE I

	Agglutination reactions with								Nitroso-indol test		Hæmolysin for sheep cells	
	H. T. serum prepared locally				* Inaba serum		* Ogawa serum					
	'HO'		'O'		'O'		'O'					
	+	−	+	−	+	−	+	−	+	−	+	−
Agglutinable ..	52	0	51	(1) 1	51	(1) 1	1	51	52	0	0	52
Inagglutinable	0	4	0	4	0	4	0	4	4	0	4	0
TOTAL ..	52	4	51	5	51	5	1	55	56	0	4	52

* Supply received by courtesy of the Director, Central Research Institute, Kasauli, India.
(1) Rough.

It will be seen that all 'HO'-agglutinable strains, except one, reacted with the Inaba 'O' serum. The non-reactor on further test was found to have become rough. Of the Inaba-serum reactors, only one strain gave a positive reaction with the Ogawa 'O' serum. Owing to the rarity of this type in India and Burma a brief history of the case in which the strain was isolated is given below :—

One Mr. W., an employee of the British India Steam Navigation Company, was on his way to Rangoon. After a long voyage from Mauritius his boat touched at Colombo for a short time, but he did not go ashore. From Colombo he travelled to Calcutta by boat in a week. In Calcutta, though he remained on board for two days, he had occasion to land for taking meals in restaurants. He then transferred himself to another boat plying between Calcutta and Rangoon. On the second day of the voyage from Calcutta the usual symptoms of cholera developed and on arrival at Rangoon he had to be sent to the Contagious Diseases Hospital for treatment. From his stool collected in the acute stage the 'Ogawa' strain was isolated.

Biochemical reactions studied were based on observations recorded by Heiberg. The inoculated sugar tubes had been incubated for a day before the results were noted, and they may be summarized as follows :—

TABLE II

	Saccharose	Mannose	Arabinose	Heiberg's group
Agglutinable 52.	+	+	−	I
Inagglutinable 4.	+	−	−	II

+ Acid production. − No acid production.

The type of reaction obtained in sugar media is clear-cut and brings out that all sero-positive strains come under Heiberg's group I. The association of this serological type with a spring disease culminating in epidemics was observed and recorded by Maitra (1925) and Tomb and Maitra (1927) in their observations in the Bihar and Bengal coal-fields.

Summary

1. An autochthonous epidemic of cholera confirmed by bacteriological study has been described.

2. The prevailing type of cholera vibrio isolated from acute cases in Burma has been recorded.

3. A case of cholera due to the 'Ogawa' type of vibrio has been detected in the course of routine examinations.

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OBSERVATIONS ON THE MOTTLED CONDITION OF HUMAN TEETH ENDEMIC IN A CERTAIN LOCALITY OF NAGERCOIL IN TRAVANCORE, S. INDIA

By S. C. PILLAI, B.A.

(Department of Biochemistry, Indian Institute of Science, Bangalore)

IT has been observed that a section of the people residing at one end of the town of Nagercoil in South Travancore is afflicted with the dental defect known as mottled enamel. The enamel of the teeth of these people, particularly in the case of the adults and the older members of the community, would appear to have been subjected to a sort of corrosion followed by pigmentation (figure 1).

In addition to the pigmented condition and the consequent disfigured appearance, the mottled teeth have also been found to be defective in structure and strength.

It has also been found that almost the entire population in that locality (consisting of about a hundred families), irrespective of sex, has this dental defect, although its degree of severity varies with age and other conditions.

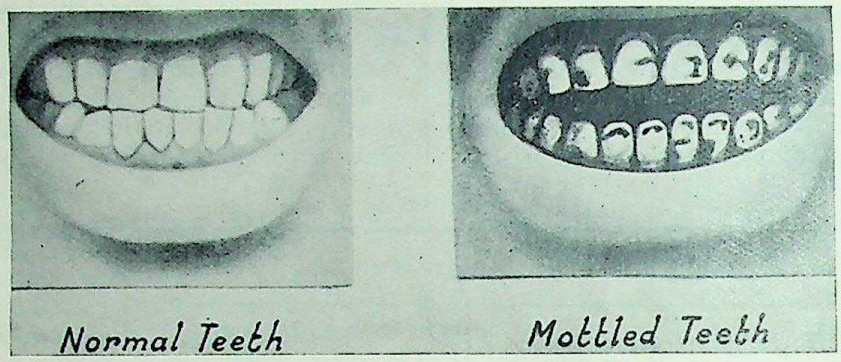

Fig. 1.

TABLE I

Chemical analysis of samples of drinking water from different sources

PARTS PER 100,000

Sample *	pH	Total solids	Loss on ignition	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Chlorides	Oxygen absorbed in 4 hours	Total hardness	Permanent hardness	Temporary hardness	Fluorine †
I	7.5	50.4	21.6	0.02	0.01	Nil	0.02	9.6	0.30	16°	12.8°	3.2°	0.4–0.5
II	7.2	42.1	25.4	0.01	0.01	Nil	0.02	7.3	0.20	18°	13.2°	4.8°	0.07
III	7.2	45.0	20.8	0.02	0.01	Traces	0.01	3.8	0.25	15°	11.4°	3.6°	Nil.
IV	6.8	35.8	23.7	0.01	0.01	Traces	0.02	5.3	0.18	14°	10.1°	3.9°	Nil.

* I. From the public well which is the drinking water supply for the persons afflicted with the dental defect of mottled enamel.
II, III and IV. From the adjoining areas where there is no occurrence of this dental defect.
† Determined according to Sanchis (1934).

A comparative study of the conditions in that place and those in the adjoining areas would show that the sectional incidence of mottled enamel can be correlated with the occurrence of fluorides in the drinking water supplies. Thus, the analysis of the drinking water supply of the afflicted persons shows the presence of 0.4 to 0.5 parts (per 100,000) of fluorine, whereas the water supplies for the other sections of people contain practically no fluorides (table I).

It may be observed from the results that the presence of fluorine is the distinctive character of the water used by those having mottled

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teeth. In other respects, the composition of the water is similar to those from adjoining areas.

The harmful effects of fluorides on the general health and development, particularly on the bone formation and tooth structure, have been increasingly recognized in recent years, but the exact nature of the toxic action of fluorides occurring in drinking water and the related mechanism of the mottling of human teeth are still obscure.

Further work in this direction is in progress and will form the subject of further communications.

I wish to thank Prof. V. Subrahmanyan for his kind interest in the work. My thanks are also due to Mr. N. K. B. Kurup, Nagercoil, for having sent me samples of water from time to time.

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[*Note.*—Attention was drawn to this very important observation regarding the fluorine content of certain water supplies in Southern India by an article in the July issue of this journal last year (Shortt, Pandit and Raghavachari, 1937). In the same number we reprinted a note from the *Lancet* referring to work in Europe on fluorine poisoning. Since this date a fuller account of the symptomatology and pathology of this condition has appeared in the *Indian Journal of Medical Research*. Further information on this important subject is welcomed.

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A RAT-FLEA SURVEY OF MATTANCHERY (COCHIN) (1937)

By P. MOHAMED ALI, M.B., B.S.

Medical Officer for Epidemics (Cochin State) and Special Plague Officer, Mattanchery

FROM the peculiar history of plague in Mattanchery, a study of the bionomics of its rat-flea population should be as interesting from a scientific as it should be useful from a practical point of view. As far as records are available, Mattanchery had, besides the present one, three outbreaks of plague during the last 50 years; the first one was in 1919 and accounted for 19 attacks and 15 deaths; the second one was in 1928 and was responsible for 14 attacks and 14 deaths during a period of seven months; and the third outbreak which lasted for four months resulted in 6 attacks and 4 deaths. The relation between the epidemic and the epizootic in all these outbreaks is rather interesting. The positive rat-falls were quite out of proportion to the number of human attacks. There used to be heavy rat-falls for months together without any human case. This unusual occurrence is all the more baffling in view of the facts that Mattanchery is one of the most thickly populated towns in the world and that the general sanitation of the place leaves much to be desired. In contradistinction to this state of affairs in Mattanchery, the conditions are reversed in the case of Kunnamkulam, a small town in the interior of Cochin State, which had a visitation of plague early in 1935. Here the number of human attacks was more and the positive rat-falls few. A rat-flea survey of Kunnamkulam will, therefore, provide interesting data which will serve illuminating comparison with those obtained in the present survey of Mattanchery town.

Previous survey.—A rat-flea survey of Mattanchery and British Cochin in January 1930 formed part of an extensive survey of the Madras Presidency conducted under the auspices of the Public Health Department of the Government of Madras. The following is the summary of the report:—

(1) The rat-density was low in all areas except Mattanchery bazaar.

(2) The flea-indices were very low in all areas.

(3) The epidemic of plague in the past was probably caused by *X. brazeliensis* or *X. astia* or by both. (It is mentioned in the report that *X. cheopis* was totally absent in Mattanchery.)

(4) The rat-epizootic prevalent needs further investigation. (The officer who did the survey was inclined to doubt whether the cause of the epizootic was really plague.)

The present survey.—Since the previous report much water has flown under the bridge. Cochin port has since been declared a major port and its maritime trade has assumed enormous proportions. It has become the only safe and sheltered harbour on the west coast south of Bombay. Apart from being the nerve-centre of commerce in the State, it promises to be the emporium of trade for the whole of South India, thereby easily entitling it to be christened the "Queen of the Arabian Sea". But, unhappily, the growing prosperity of the town is not an unmixed blessing. On account of the maritime connections that Cochin port has with important ports in the world, the chances of importing infection to Mattanchery are great and will continue to be so as the volume of trade increases; and the conditions in crowded Mattanchery, where there are a large number of rat-infested, grain godowns, which do not easily admit of rendering rat-proof, make the town dangerous alike to health and trade.

Thus, further information regarding this all-important question of plague in Mattanchery is required so as to organize and systematize more effective measures to prevent an outbreak of this serious disease. Hence the present survey.

Physical features of the town.—Situated between the Arabian Sea on the west and the back waters in the east, and contiguous with British Cochin in the north, Mattanchery forms an important boundary to the Cochin harbour. Into an area of 3 square miles is crowded

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a population of wellnigh 50,000. There is hardly any demarkation or differentiation between residential quarters, shops and godowns in the bazaar area. The climate is hot and humid, as the place is low and swampy. The mean annual temperature is a little over 81°F., variation ranging from 75°F. in December to 86°F. in May. The average annual rainfall in 1937 was 123¾ inches as against 116¾ inches in 1936; the major portion of the rainfall is generally during the south-west monsoon (June to September). The following are the meteorological conditions as observed during the survey :—

Mean maximum temperature 85.23°F.
" minimum temperature 76.38°F.
" dry bulb thermometer at 9 a.m. 80°F.
" wet bulb thermometer at 9 a.m. 77°F.
" relative humidity 86.24 per cent.
" saturation deficiency 0.1425 inch.

Chief imports and exports.—Cochin imports rice from Akyab, Bankok, Bassein, Bombay, Calcutta, Coconada, Moulmein and Rangoon, and paddy from Akyab, Bankok and Saigon. From Bombay and Karachi are imported large quantities of other grains and pulses. Of late there has been noticed a regular decline in the imports of rice and paddy, a welcome feature from the point of view of plague. The chief exports are copra, coco-nut oil, rubber, coir and cashew-nut kernels.

The survey.—The rat-flea survey commenced on the 18th November and ended on the 18th December, 1937. Twenty-four modified elongated 'wonder' traps were set daily in representative localities in all the 19 wards in the municipal area. Traps were conveyed to the laboratory in canvas bags made to fit each trap lest the fleas should escape during transit. The rats and fleas were killed by cyano-gassing in a small wooden chamber. Traps containing more than one species of rat were discarded to avoid variation of results in calculating specific flea-indices. The rat-density, as generally calculated, is, in my opinion, scientifically incorrect besides being of doubtful significance. Hence no attempt is made to give such figures. All the rats were autopsied, and none of the smears taken from them show *Bacillus pestis*. As the survey extended only for a month seasonal variation in rats and fleas could not be given. The grain-godowns are mostly situated in wards I and II and the remaining wards consist of residential quarters. Hence figures are not given for individual wards, and the whole area has been arbitrarily divided into godown area and residential quarters.

Rats.—Table I gives the different species of rats trapped. *Rattus rattus* forms the majority of them and they are predominantly from the residential area. As many *Rattus norvegicus* were obtained from the residential quarters as from the godowns. Bandicoots and musk rats mostly favour residential quarters. No Gunomys, Gerbilles or *Mus musculus* were obtained, perhaps on account of the smallness of the total number of rodents trapped for the survey.

Fleas.—Table II gives the varieties of fleas obtained and their relative numbers. The most noteworthy feature here is the presence of *Xenopsylla cheopis* which were reported to be absent in Mattanchery during the previous survey. They seem to be present in both the residential and godown areas, though it is noteworthy that there is a preponderance in the latter. However, their comparative scarcity is of some epidemiological importance as far as plague in Mattanchery is concerned. *Xenopsylla brazeliensis* are also found in residential

TABLE I

Species	Number in different areas		Percentage in different areas		Percentage of all rats
	Residential area	Godown area	Residential area	Godown area	
R. rattus ..	198	69	74.2	25.8	91.7
R. norvegicus ..	7	7	50	50	4.8
Bandicoots ..	6	1	85.7	14.3	2.4
Musk rat ..	3	0	100	0	1.1

TABLE II

Species	Number in different areas		Percentage in different areas		Percentage of all fleas
	Residential	Godown	Residential	Godown	
X. astia ..	544	136	71.7	28.3	68
X. cheopis ..	21	25	45.7	54.3	6.5
X. brazeliensis ..	87	92	48.2	51.8	25.5

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as well as godown quarters. This is also against the findings in the previous survey in which it is said that they are conspicious by their presence in Mattanchery bazaar alone where the grain-godowns are situated. *Xenopsylla astia* abound in residential quarters. They are by far the largest single species that is present in Mattanchery.

Flea-indices.—Table III gives the various flea-indices. The total flea-index is low. As would be expected from table II, astia index is the highest and cheopis index the lowest. The astia index for *Rattus norvegicus* is slightly higher than that for *Rattus rattus*. But it is worth noting that the cheopis index is the lowest for the *Rattus norvegicus* while the brazeliensis index for the same rat is comparatively very high. The total flea-index and the specific flea-indices for the godown area are higher than the corresponding figures for the residential areas. The high cheopis index in the godown area is significant.

TABLE III

A.	(1)	Total flea index for the whole area				2.42
	(2)	Flea index for the godown area				3.2
	(3)	Flea index for the residential area				2.2
B.	(1)	Total astia index				1.65
	(2)	Total cheopis index				0.16
	(3)	Total brazeliensis index				0.60
			Godown area	.. ..	Residential area	
C.	(1)	Astia index ..	1.77	.. ..	1.60	
	(2)	Cheopis index ..	0.32	.. ..	0.10	
	(3)	Brazeliensis index ..	1.20	.. ..	0.41	
			R. rattus	*R. norvegicus*	Bandicoots	Musk rats
D.	(1)	Astia index for ..	1.59	1.78	1.14	0.66
	(2)	Cheopis index for ..	0.16	0.14	Nil	0.33
	(3)	Brazeliensis index for	0.49	3.00	0.71	0.66
	(4)	Total flea index for ..	2.24	4.92	1.85	1.65

Plague in Mattanchery.—As I have mentioned in the opening paragraph of this report, the relation between the epizootic and the epidemic that has been noticed in all the outbreaks in Mattanchery is anomalous. There used to be heavy rat-falls for long periods with few or no human attacks. This phenomenon is not peculiar to Mattanchery alone. Workers in this field have met with similar conditions elsewhere in India. Many hypotheses have been advanced to explain this seeming incongruity. The absence of intimate association between human beings and the particular species of rats which are found to be the greatest sufferers from plague in an epidemic is mentioned by some as a cause for paucity of human cases. G. D. Chitre does not fully concur with this view. The relative number of the different species of fleas in a particular place is also spoken of as an influential factor. Baffled with the conditions in Mattanchery, the officer who did the previous survey even went to the length of doubting the genuineness of plague as a cause of the rat-epizootic in the town. As to this there is no doubt, as culturing and animal experiments carried out in the course of the present outbreak have proved beyond doubt that there is plague among rats in Mattanchery.

Two very significant facts were noticed by me in the present outbreak : one is that 72 per cent. of the positive rats obtained were of the norvegicus species; and the other is that *X. cheopis* were found in comparatively large numbers on *R. rattus* trapped from two houses where human attacks had occurred. To me these two facts appear to have important bearings on the peculiar relationship observed in Mattanchery between epizootics and epidemics.

It is admitted on all hands that *X. cheopis* is a far more efficient carrier of plague than the other two closely allied species. It attacks man very readily ; *X. astia* does so with reluctance especially above 80°F., while *X. brazeliensis* hardly bites him at all (Hirst and Goyle). Chitre and Tailor have, however, found that *X. astia* can transmit infection in guinea-pigs, and that it could be got to bite man at temperatures from 76° to 84°F. Hirst has found in Colombo that *X. cheopis* formed less than 1 per cent. in non-plague areas while in plague areas this species formed 17 to 46 per cent. of the fleas. My observation in the present epidemic lends colour to this view. Hirst has also found that it was impossible or very difficult to transmit plague from rat to rat through the bites of *X. astia*.

So, the comparative scarcity of *X. cheopis* in Mattanchery, as the present survey shows, may be one of the main causes for the paucity of human attacks. The fact that *R. norvegicus*, which are found to be the most vulnerable victims to plague at present in Mattanchery, do not so freely associate with man as *R. rattus*, and that the cheopis index is the lowest for them (*R. norvegicus*) also points to the same conclusion. The high brazeliensis index for *R. norvegicus* must, if we are to give credence to the views of Hirst, further support this view.

It has been observed by some workers on plague that saturation deficiency and mean temperature help to determine the incidence of human plague in a locality. According to St. John Brooks and Rogers, a mean temperature over 80°F. when accompanied by a saturation

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deficiency of over 0.03 of an inch has a tendency to check the disease. Dold in Shanghai and Heggs in Baghdad arrived at the same conclusion. Mattanchery satisfies both these conditions. Thus the saturation deficiency of much over 0.03 of an inch coupled with the almost uniform mean temperature of over 80°F. might also be one of the causes why plague has not got a firm footing in Mattanchery.*

Summary.

(1) Out of the 291 rats 267 were *R. rattus*, 14 *R. norvegicus*, 7 bandicoots and 3 musk rats.

(2) Of the 705 fleas, 480 were *X. astia*, 46 *X. cheopis* and 179 *X. brazeliensis*.

(3) Two facts which were noticed during the present outbreak of plague and which are believed to have some importance in the epidemiology of plague in Mattanchery are mentioned.

4. The comparative scarcity of *X. cheopis* is suggested to be an important cause for the absence of many human attacks of plague despite heavy positive rat-falls.

5. The mean temperature and the saturation deficiency are also suggested as contributory factors in checking the disease.

6. For further elucidation of plague in Cochin, a rat-flea survey of other important towns in the State, especially Kunnamkulam where there was an outbreak of plague in 1935, is suggested.

7. Since the chances of importation of all varieties of fleas and infection to Mattanchery are becoming greater and greater proportionately with the growing importance of the town, permanent plague-preventive measures, such as making the godowns rat-proof, improved sanitation and sustained rat-destruction, are indicated.

Before concluding this report I should mention, with gratitude, that the services of Dr. N. S. Sankaranarayanan, M.B., B.S. (Madras), D.P.H. (Calcutta), Health Officer, Mattanchery Municipality, in conducting the survey, were of great help to me.

[* *Note.*—St. John Brooks pointed out that a high temperature is detrimental to plague transmission, but that in a dry climate, one in which the saturation deficiency is above 0.300 of an inch, transmission may be checked, even when the mean temperature is below 80°F. On the other hand, when the atmosphere is humid, and the saturation deficiency below 0.300 of an inch, plague transmission occurs, even if the temperature is a little above 80°F.

In Mattanchery the temperature is usually above 80°F.; this would tend to check the spread of plague. But the climate is also very humid, and the saturation deficiency is usually below 0.300; this, according to Brooks, would make transmission possible, even with the temperature above 80°F. A saturation deficiency of 0.030 at 80°F. means almost complete saturation, about 97 per cent relative humidity, and naturally the saturation deficiency at Mattanchery is usually more

(*Continued at foot of next column*)

EXPERIMENTS ON THE STABILITY OF SEMINAL STAINS FROM A MEDICO-LEGAL STANDPOINT

By S. N. CHAKRAVARTI, M.Sc., D.Phil. (Oxon.), F.C.S., F.N.I.

Chemical Examiner to Government, United Provinces and Central Provinces, Agra

and

S. N. ROY

DURING the course of examination of thousands of articles for presence of spermatozoa, it has been found that a much larger proportion of negative results is obtained in cases of mixed blood and seminal stains (and in very old stains) than in cases of seminal stains alone. To throw light on the underlying causes of this, the following experiments were instituted. A piece of semen-stained cloth was cut into four pieces. Two of these pieces were covered with blood. One of these pieces and one piece containing semen only were kept in two separate dishes in the dry state. The remaining two pieces, one containing semen alone and the other both semen and blood, were moistened with water and kept exposed to the atmosphere in open dishes. These pieces were examined for spermatozoa and subjected to other tests every 7 or 10 days at the beginning and at larger intervals after a month. The result of these experiments is outlined in the following table. At the beginning, all the four pieces of cloth contained a larger number of complete spermatozoa and gave the Florence test for semen.

It will be seen from the table that complete spermatozoa could be detected on the dry pieces even after 100 days, although the Florence test was not given by the piece containing blood and semen after 44 days. In the case of the wet stains, the tails begin to disappear after 10 days and are unrecognizable after 75 days, while clear heads can be detected even after 100 days. *The Florence test was negative even after 48 hours.*

These results are very important as they show that too much importance should not be attached to the Florence test (even as a negative test), particularly in case of old stains [*cf.*, Bagchi (1937), Chakravarti (1937), and Thomas (1937)]. These experiments also show that search for *complete* spermatozoa is not likely to give any results in case of old, wet stains and in these cases it would be justifiable to declare a positive result if a number of good heads were found.

(*Continued from previous column*)

than this, but not, we imagine, more than 0.300 of an inch which corresponds to a relative humidity of about 71 per cent at 80°F. We do not know from where the writer got this figure 0.030 of an inch; it is not apparently a clerical error as we have written to him on the subject and he has repeated this figure.—EDITOR, *I. M. G.*]

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TABLE

Time of examination	Semen stains containing blood kept in a dry state	Semen stains containing blood kept in a wet state	Semen stains kept in a wet state	Semen stains kept in a dry state
10 days after.		The stains were found to be of green colour and decomposition had set in. Fungus growth was found on the stains. Spermatozoa with short tails were detected. Florence test was negative. Spectroscopic test for blood was positive.	Fungus growth on the stains were found and a decomposing odour was also noticed. Spermatozoa with short tails were detected. Florence test was negative.	
17 days after.	No change of colour of the stain and no decomposing odour could be found. Spermatozoa with long tails were detected. Florence test was positive. Spectroscopic test for blood was positive.	The decomposing odour was still present. The colour of the stain was green. Short-tailed spermatozoa were detected. Florence test was negative. Spectroscopic test for blood was positive.	A decomposing odour was again noticed. Spermatozoa with short tails were detected. Florence test was negative.	
24 days after.	Complete spermatozoa were detected. Florence semen test and spectroscopic test for blood were positive.	Mainly heads of spermatozoa were detected. Few had short tails. Florence test was negative. Spectroscopic test for blood was positive.	A few spermatozoa with short tails were detected but mostly heads only were found. Florence test was negative.	
After 31 days.	Complete spermatozoa were detected. Florence semen test and spectroscopic test for blood were positive.	Very few spermatozoa with very short tails were detected. Florence test was negative. Spectroscopic test for blood was positive.	Only sperm heads could be seen. The tails had all disappeared. Florence test was negative.	
44 days after.	Several complete spermatozoa were detected. Florence test for semen was negative. Spectroscopic test for blood was positive.	Only heads of spermatozoa could be detected. A few had very short stump-like tails. Florence test was negative. Spectroscopic test for blood was positive.	Only sperm heads could be detected. Florence test was negative.	Large numbers of complete spermatozoa were detected. Florence test was positive.
75 days after.	Complete spermatozoa were detected. Florence test was negative. Spectroscopic test for blood was positive.	Only heads of spermatozoa could be detected. Tails were found to be absent in all. Florence test was negative. Spectroscopic test for blood was positive.	Only heads of spermatozoa could be detected. No tails could be found. Florence test was negative.	
100 days after.	Complete spermatozoa were detected. Florence semen test was negative. Spectroscopic test for blood was positive.	Only heads of spermatozoa could be detected. No tails were found in any. Florence test was negative. Spectroscopic test for blood was positive.	Only heads of spermatozoa could be detected. No tails could be seen. Florence test was negative.	Large numbers of complete spermatozoa were detected. Florence test was positive.

These experiments afford a scientific basis for the rule that articles of clothing, etc., having suspected blood or seminal stains should be thoroughly dried before being sent for examination—a rule which is often unthinkingly disregarded by the authorities who forward the articles.

For detecting spermatozoa, a method developed in this laboratory involving the use of two stains (erythrosine and malachite green) and sulphuric acid, which preferentially destroys any foreign matter present, was used throughout (Ganguly, 1936). This method has been found to be superior to all other known methods of detecting spermatozoa.

Summary.—During the course of examination of thousands of articles for spermatozoa, it has been found that an unusually large proportion of negative results is obtained in cases of mixed blood and seminal stains and in very old stain

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cases. To throw light on the underlying causes of this, a series of experiments were instituted which show that while Florence test is given by dry seminal stains even after 100 days, in the case of mixed stains the Florence test is not given after 44 days, although complete spermatozoa can be detected. In the case of wet stains, the Florence test is not given even after 24 hours, and tails begin to disappear after 10 days and are undetectable after 75 days. These results are very important and show that too much importance should not be attached to Florence test even as a negative test. These experiments further show that it would be justifiable to declare a positive result if a number of good heads are found.

[*Note.*—Whether a positive result should be returned on finding heads alone is a question; many medical jurists will not agree with the writer on this point.—EDITOR, *I. M. G.*]

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A Mirror of Hospital Practice

A CASE OF HYPERNEPHROMA OF THE KIDNEY WITH SECONDARIES IN THE OS CALCIS AND THE BRAIN

By C. D. TORPY, M.M.F. (B.), I.M.D.
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HYPERNEPHROMATA constitute, it is stated, about 60 per cent of all renal tumours. One can hardly therefore offer rarity as the reason for the publication of this case. There are, however, more important reasons, as the case presents several unusual features.

The patient, H. V. D., male, tea-planter, born and lived almost continuously in India, married, was admitted into the hospital for the investigation of a 'painful left heel' and bouts of painless hæmaturia, which he stated followed the treatment given him for the painful heel. He had one child, who, presenting many features of kidney disease two months after birth, succumbed seven months later to a cerebral tumour which, unfortunately, was not proven by a post-mortem examination.

Previous history.—In April 1936, he developed a small 'boil' over his left groin, which with the usual household remedies soon subsided. A few days later, however, he noticed pain and tenderness in his left heel, which interfered with walking. He attributed this to the inflammatory condition in his groin, from which he had just recovered. With the passage of time, however, there was no improvement in the condition; in fact, it became more acute and painful, finally restricting his walking, or even applying any pressure on the heel. There was no obvious swelling or inflammation at the time. He then consulted his doctor who thought that gout or

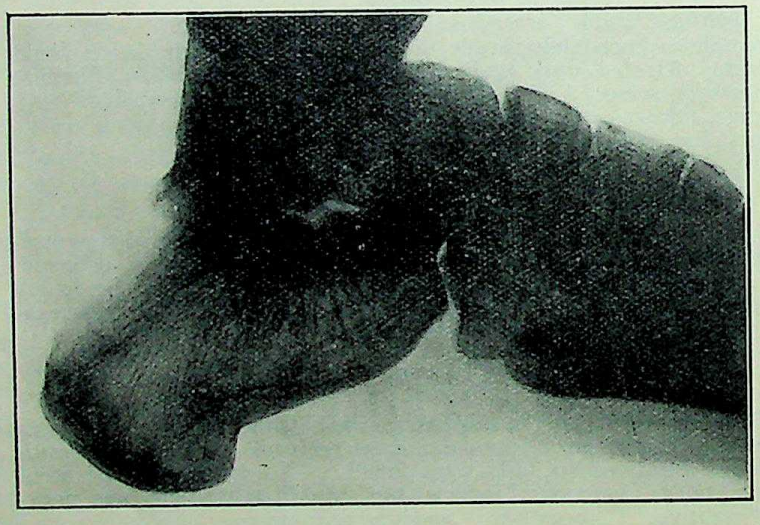

Fig. 1.—Skiagram of left os salcis shows an irregular area of bone absorption with some feathery reaction at the upper surface of the bone posterior to the astragalo-calcaneal joint.

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a strained ligament might explain the case and prescribed accordingly. Finding that the patient did not improve, he sent him down to Calcutta for an *x*-ray examination.

This was carried out, and a skiagram of the left heel revealed an irregular area of bone absorption with some feathery reaction at the upper surface of the os calcis, posterior to the astragalo-calcaneal joint. It was suggested by the radiologist that the appearances may be due to a specific osteitis but that, on the other hand, an osteogenic neoplasm could not be excluded. The Wassermann reaction was negative, but in the course of an investigation for the presence of a toxic factor, a streptococcus was isolated in pure culture from the patient's throat, from which an autogenous vaccine was prepared. The left heel was put up in a plaster-of-paris cast and the patient returned to the tea-garden to have his course of autogenous vaccine. It was now thought that the cause of the trouble had been

Fig. 2.—Right kidney showing tumour.

found in the streptococcus from the patient's throat. Three injections were given uneventfully, but a couple of hours after the fourth injection, the patient developed a sudden and severe painless hæmaturia. Being a chronic malarial subject he thought an attack of black-water fever had added to his troubles, but with the arrival of his doctor, his fears were allayed. As soon as the hæmaturia was over, and patient was fit to travel, he returned to Calcutta to have this new feature of the case investigated radiologically and biochemically.

With perabrodil, an intravenous descending pyelography was carried out. The control picture showed the right kidney shadow to be definitely larger than the left. Excretion of the dye, as seen in the pyelograms, took place on the left side, the outlines of the pelvis and calyces appearing normal, but on the right side only the very faintest suggestion of traces of excretion could be seen. The radiologist suggested that the appearances might be due to an inflammatory condition of the kidney, and that a retrograde pyelography and further investigation of kidney function should be undertaken. At this juncture, the patient was admitted to hospital, and came under our care.

The patient was an elderly man, very sparely built, of poor physique, bright eyed, thick eyebrows, hectic flush of both cheeks, presenting a typical tuberculous diathesis. No active signs of tuberculosis could, however, be elicited in the lungs; this was confirmed by radiological findings which showed only a small round patch, the size of a pea, an old fibrosed focus of infiltration.

Abdomen, soft and lax; spleen and liver, not palpated; colon, not thickened or tender. There was definite tenderness over the right post-renal area and the kidney appeared to be enlarged. No burning or scalding on passing urine, but patient gave a history of attacks of painless hæmaturia, which he stated cleared up rapidly and uneventfully. Blood urea, 46.6 mg. per 100 c.cm.; non-protein nitrogen, 40.15 mg. per 100 c.cm. Urea concentration test showed very poor excretion, concentration varying from 0.5 to 1.4 per cent. The hæmogram revealed nothing of note, except a moderately severe lymphocytosis (45 per cent).

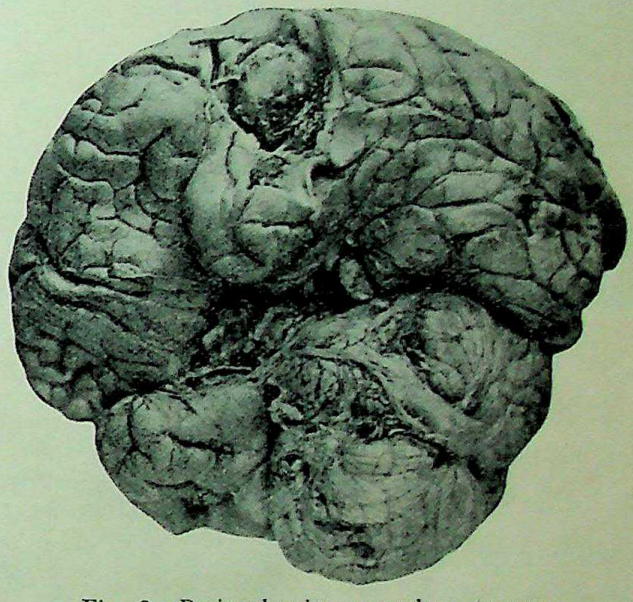

Fig. 3.—Brain showing secondary tumour.

Very soon after admission to hospital, patient had another bout of painless hæmaturia which cleared up rapidly without any treatment.

A cystoscopy and retrograde pyelography were later carried out. The bladder appeared perfectly normal. The right ureteric orifice was seen to be injected, swollen, and œdematous; the left was fairly normal.

Chromo-cystoscopy showed that the right kidney excreted in 9 minutes, and the left in 6½ minutes.

The pyelographic appearances confirmed the provisional diagnosis of a hypernephroma in the right kidney with a metastasis in the left os calcis.

A suspicion that the condition might after all be tuberculous in origin, for which clinical evidence was not wanting, and not malignant was settled by cutting down on the tumour in the os calcis and submitting sections for the pathologist's opinion.

On cutting down, an irregular area of bone absorption filled with a highly vascular, bluish tumour, soft and cyst-like, was found at the upper surface of the os calcis, posterior to the astragalo-calcaneal ligament. Sections of the bone and tumour were submitted for examination, and reported on by the pathologist as being typical of a hypernephroma.

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The night after the operation, the patient suddenly became worse, complained of severe headache, and became restless, had a large vomit at midnight, followed six hours later by another copious one; pulse feeble and irregular. The speech became affected, blurred and inarticulate. It was also noted that there was some paresis of the limbs on the right side. In a couple of days' time the condition appeared to improve, the speech becoming more distinct, and the weakness on the right side less apparent. When he started to speak, he spoke fairly clearly for a few seconds only, but soon became difficult to understand, though one left him feeling that he knew what he wanted to say, but could not put it into spoken words. Ophthalmoscopy showed nothing of note except marked congestion of discs. As the co-operation of the patient could not be obtained, no tests for hemianopia were done.

Soon the patient presented the clinical picture of a cerebral tumour; marked headache, and symptoms referable to the sensorium, and psychical centres. With sudden temporary increase in pressure, attacks of more marked loss of consciousness not infrequently took place, and he became gradually exhausted taking a critical turn on the night of the 6th October, 1936, ushered in by a copious vomitus, slowing of the pulse rate, and loss of consciousness, and on the next day the patient died after an illness spread over a period of six months.

A post-mortem examination was carried out. A large hypernephroma of the right kidney was present, the left kidney appeared normal. Lungs, normal, no secondaries present. Brain—small secondary tumour in left occipital lobe, another small one in frontal lobe.

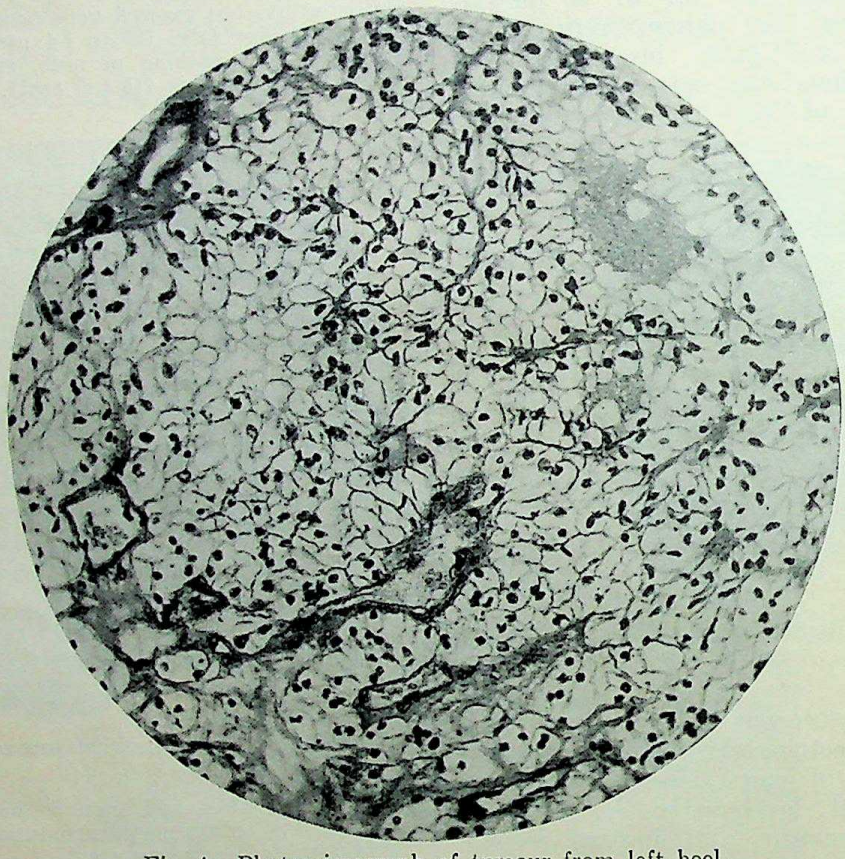

Fig. 4.—Photomicrograph of tumour from left heel.

Points of interest

1. A painful left heel, the site of the secondary tumour was the first indication of any disease being present, though the primary lesion was in the right kidney, until then it lay dormant, showing no clinical signs of its presence.

2. The administration of an autogenous vaccine appeared to have provoked a bout of hæmaturia, the cause of which is not clear.

3. The radiological findings of the left heel and the kidneys at first suggested an inflammatory cause, and the diagnosis was for a little time completely missed, though in retrospect, when the hæmaturia set in, a diagnosis of hypernephromata could have been the only one likely.

4. In spite of the marked infiltration present in the right kidney, as seen at the post mortem, the function appeared to be quite good, by the indigo-carmine test, which suggests this test is not altogether reliable.

5. Secondaries in the brain are not usual in hypernephromata, whereas their absence in the lungs is rare.

6. The painless hæmaturia rather added to the difficulty in arriving at a correct diagnosis, this being a feature of both tuberculous disease of the kidneys and of hypernephroma.

My thanks are due to Lieut.-Colonel H. E. Murray, I.M.S., Surgeon Superintendent, Presidency General Hospital, Calcutta, for his permission to publish this case, and also to Professor M. N. De of the Calcutta Medical College for the pathological findings, the micro-photograph, and the other photographs, and to Lieut.-Colonel J. A. Shorten, I.M.S. (retd.), for the skiagrams.

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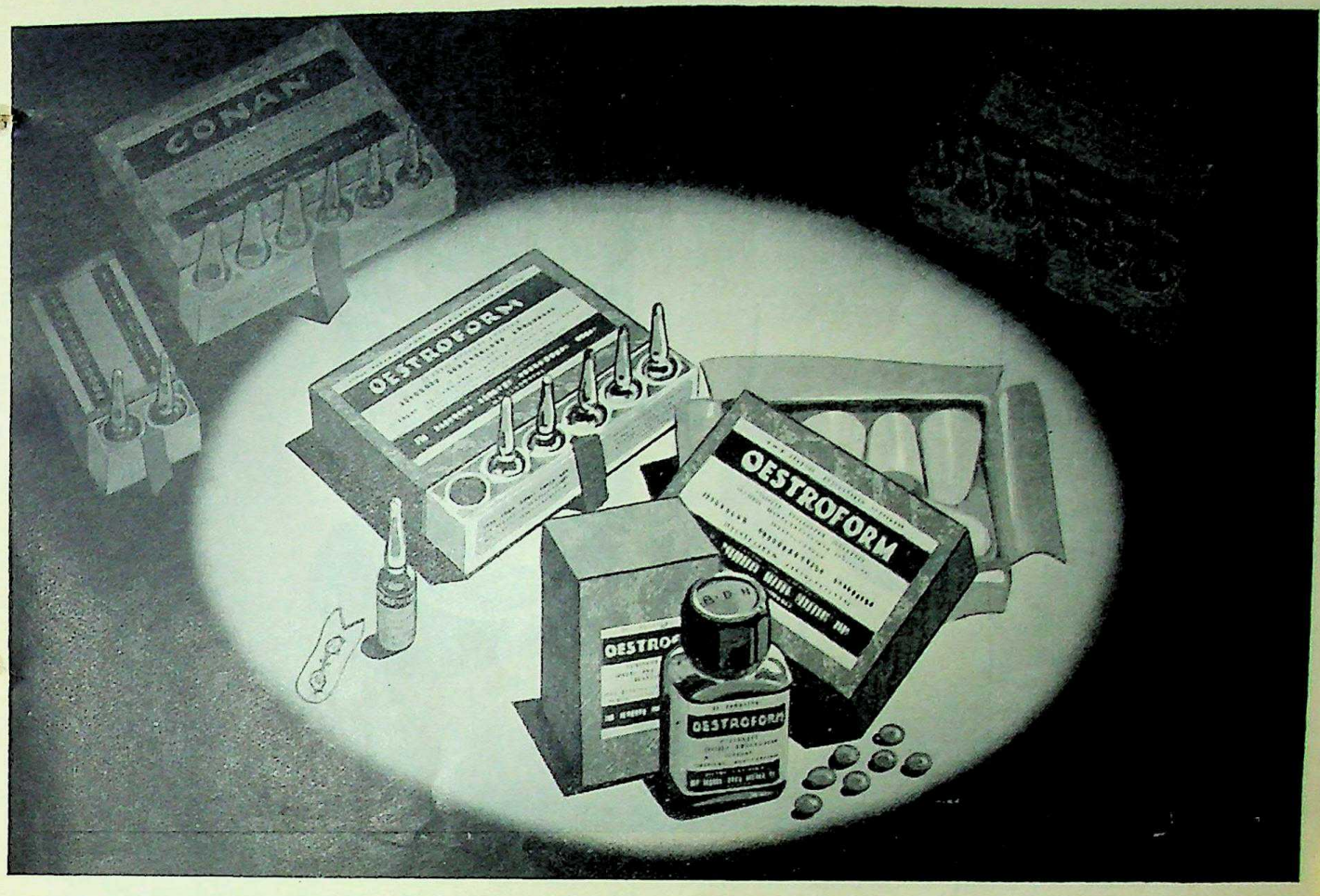

OESTROFORM

In the Treatment of Vulvo-Vaginitis

According to a recent paper on gonococcal vulvo-vaginitis in children (*Lancet*, April 23rd, 1938, p. 932) '. . . *the most modern treatment of such cases consists* (*in addition to local irrigation, vaginal packs, and vulvar sitz-baths*) *in administration by mouth or by injection of an oestrin preparation.*'

It is stated further (*Lancet*, April 23rd, 1938, p. 960) that '. . . *the purulent gonococcal discharge soon gives place to one containing many squamous epithelial cells and Döderlein's bacillus but no gonococci.*'

The treatment usually recommended consists of the administration of one tablet of Oestroform (1000 I.U.) four times daily together with the collateral use of one or two Oestroform pessaries daily.

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Indian Medical Gazette

JULY

WORLD DISTRIBUTION OF DISEASE: THE CHANGING PICTURE

THE division of diseases into two arbitrary groups, those of tropical and those of temperate climates, is a convenient one and to a certain extent a sound one, especially regarding tropical diseases, many of which are strictly limited to the tropics or even to certain parts of the tropics, by the distribution of the insect or other carriers necessary for their propagation. Possibly as an offset to this allocation of certain diseases definitely to the tropics there has grown up in the minds of medical men in general, the idea that many of the diseases common in temperate climates do not exist among natives of tropical countries.

Twenty years ago it was confidently stated, particularly with regard to tropical Africa, that African natives never suffered from cancer. Such statements were made by doctors who had often spent many years in the countries concerned, so they carried the weight of authority with the professions as a whole. This is easily understood because in those days properly equipped research and pathological laboratories, where carefully conducted investigations could be carried on, were practically non-existent in the tropics, and further, at that time it was not customary to apply statistical methods to the examination of data on the incidence of disease, so it was common for inexact or insufficiently numerous observations to be accepted as statements of fact. The result was that many erroneous ideas were, and to some extent still are, held on the prevalence of this and other common diseases. It is now generally accepted that natives of all tropical countries, living a simple life, are just as liable to malignant disease as are the inhabitants of highly civilized countries, and it is not as was once widely taught, a disease to which civilized man is particularly liable on account of his highly complicated and more or less artificial life under the conditions of modern civilization.

Acute rheumatism is a disease the existence of which in India was for a long time denied, or if the fact or its presence were admitted it was considered to be extremely rare. A considerable amount of evidence has now been accumulated, notably in a series of articles recently published in this journal, to show that it is probably a fairly common source of heart disease in this country. It is true that most of the data have been collected in the northern part of India which in the strictest sense is not tropical, as the district where the work was done is about four degrees north of the Tropic of Cancer. An artificial line such as this is of no importance in the present instance, as the United Provinces, where most of these observations were made, is a typical, comparatively dry, inland tropical climate of the plains.

Still another important group of diseases, the gastric and duodenal ulcers, were once considered almost non-existent in India. The reason given for this supposed state of affairs being that the simple diet of the majority of the inhabitants and the different amount of hydrochloric acid in the gastric juice of Indians from that of Europeans, which was caused by the differences in the dietetic habits, reduced the liability to ulceration in this part of the gastro-intestinal tract. These assumptions have now been shown to be incorrect for there is found to be no essential difference between the gastric juice of Indians and Europeans no matter what the principal constituents of their diets may be, and the incidence of peptic ulceration is found to be relatively high throughout India. At first its presence was only recognized in the north and north-west and it was said to be absent in the south and truly tropical parts of the country, but now it is becoming clear that it is a common disease all over the country, and evidence is rapidly accumulating that peptic ulceration, and its not uncommon sequel malignant disease of the stomach, are probably more common in South India than they are elsewhere.

Certain skin diseases that are common in colder countries are said to be non-existent in the tropics. One of the best examples is psoriasis, and in books on skin diseases this supposed effect of climate on its distribution is regularly referred to. In a recent lecture on psoriasis delivered in England by an experienced dermatologist, it was stated that one of the most satisfactory methods of bringing about improvement in psoriasis was to send the patient to a warm climate. This may be true for some cases acquired in England, but it cannot apply to those which arise in India, for a Calcutta dermatologist would be hard put to it to find a warmer climate than Calcutta is for the greater part of the year, to which he might send the many cases of psoriasis that arise and flourish in its warmth. It is frequently seen in Calcutta that some cases improve in the cold weather and show an exacerbation in the hot weather, while others, conforming with the above statement, are worse in the cold weather and better in the heat, therefore climate probably has little to do with the incidence of psoriasis. This is not the point under discussion, however; the fact it is wished to emphasize is that psoriasis is common in India, and that because psoriasis arising in cold climates may be benefited by going to the tropics, this is not evidence that the disease cannot arise there.

Leprosy is a disease which was widespread in colder climates a few generations ago but it has practically disappeared from there and is now almost wholly confined to the tropics.

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Evidence is accumulating that tuberculosis appears to be following the same course and is dying out in temperate climates while becoming more frequent in the tropics. The altered and altering distribution of these two diseases, however, is mainly because social, hygienic and dietetic improvements have been more rapid in the temperate zones than in the tropics.

The above are a few of the most striking examples of what adequate observation and careful work have done in recent years in correcting our views on the distribution of some diseases, and it indicates that the inhabitants of the tropics are not exempt from the major diseases of colder climates. The reverse is not true, however, because there are a number of serious and widespread diseases which can be rightly termed tropical and tropical only, and which must remain confined to this part of the world because their transmission is not possible in cold climates, as the necessary vectors cannot live there. In other words, climate *per se* has not nearly as much influence on disease incidence as has been supposed, and as further careful work is done, especially in tropical countries, we may anticipate a smoothing rather than an accentuation of the differences between disease distribution in temperate and tropical climates.

Special Articles

PRESENT POSITION OF ANTI-MALARIAL DRUG THERAPY IN INDIA

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ANTI-MALARIAL drugs may be divided into two main groups :—

(I) The cinchona derivatives.

(II) Other anti-malarial remedies; this group includes most of the synthetic drugs.

(I) CINCHONA DERIVATIVES

(*A*) *Cinchona alkaloids*

It is well known that as many as 20 alkaloids, and probably more, are present in the cinchona bark, all of which are chemically closely allied to each other. These alkaloids have been divided into (*i*) crystallizable alkaloids, and (*ii*) amorphous alkaloids. The former group only, have anti-malarial properties; the amorphous alkaloids have been shown to be inactive in this respect. Of the crystallizable alkaloids present, four occur in large quantities; these are quinine, quinidine, cinchonine and cinchonidine. Till recent years these alkaloids were the only drugs available which had specific action on the malarial parasites. If given in suitable doses and under proper conditions their action in controlling malarial paroxysms is certain. Of the four alkaloids, quinine still holds the foremost position in the treatment of malaria, though the anti-malarial value of the other three alkaloids has been fully established. From the data now available there is no room for doubt that quinidine, cinchonine and cinchonidine, in similar doses to quinine, are equally, or very nearly as effective in the treatment of malaria. In considering the relative therapeutic value of different alkaloids, it is of importance to take into account their effect in causing harm or inconvenience to the patient. It may be said in favour of quinine, that it can as a rule be given in sufficient doses and for sufficiently long periods without danger to the patient. Cinchonine is more nauseating than quinine and is liable to produce blurring of vision. Quinidine is also more nauseating and has a powerful depressant action on the heart. Cinchonidine is neither toxic nor irritant, but is distinctly the weakest of the four alkaloids.

The importance of the fact that all alkaloids have marked anti-malarial properties is very great to India, where the economic condition of the people is low and purified quinine preparations, on account of their high price, are beyond the means of ordinary people. The reasons why quinine is more expensive than the total alkaloids of the bark is:—(*i*) that its proportion in the bark usually is a little more than half of the total alkaloids. *Cinchona succirubra* and *Cinchona officinalis* barks, for example, contain about 5 to 6 per cent of total alkaloids of which only 3 per cent is quinine. *Cinchona ledgeriana* contains somewhat higher proportions. (*ii*) The cost of its separation from other alkaloids and purification further adds to its price. It would follow, therefore, that if the total alkaloids are used they will be cheaper than if only quinine by itself is used. It was for this reason that 'cinchona febrifuge' has been used in India, and the League of Nations have introduced *totaquina* which contains 70 per cent of the total alkaloids of which 15 per cent must be quinine. By this means it is hoped that the treatment can be made less expensive and extended among the masses.

Some of the other alkaloids of cinchona bark which occur in smaller quantities than the four alkaloids stated above, for example, cupreine and cupreidine compounds have also anti-malarial properties. Cupreine sulphate in doses of 1 gm. was found by Giemsa and Werner to be a good substitute for quinine in human malaria, but it is much more expensive and toxic. These observers also obtained good results with quin-ethyline and quin-propyline in doses of 0.3 to 0.4 gm. in human malaria and with these compounds and quinamyline in bird malaria. Ethyl-hydrocupreine or optochin has been tried in malaria but it is a toxic compound.

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The hydro-alkaloids are said by some to be more effective than ordinary salts. Giemsa and Werner, Baerman, MacGilchrist, Morgenroth, Goodson and many others have proved that hydroquinine, as regards both its tolerability by the human subject and its parasiticidal action is superior to quinine. Rabe and his co-workers have been successful in preparing hydroquinine and hydroquinidine synthetically, but the process is so costly that there is no likelihood of possible competition between the artificial and natural products.

The disadvantages of the cinchona alkaloids are :—(1) They have no action on the sporozoites injected by the mosquitoes, and therefore they cannot have any really prophylactic action in this disease. This was demonstrated by Yorke and Macfie who showed that 18 grains of quinine for 5 days before and 7 days after the mosquito bite failed to avert an attack of malaria, but if the drug was continued for 10 days, the disease did not develop. This shows that these alkaloids have little effect on the injected sporozoites but act on the asexual forms liberated from the infected red blood corpuscles.

(2) Cinchona alkaloids have little effect on the sexual forms of malignant tertian parasites. They however impede the formation of the pregametocytes of *P. falciparum* and may thus be regarded as directly schizonticidal and indirectly gametocidal.

(3) They do not prevent relapses.

(4) These alkaloids do not act uniformly on all strains of malaria.

After the Great War there was a feeling against the use of cinchona alkaloids, especially quinine, and it was said that this drug was not effective against certain forms of malaria. Further investigation, however, showed that this was not due to any fault of the drug but due to its improper use.

It has been proved by hæmatological and other evidence that the best method of administration of these alkaloids is by the mouth. It is advisable to give them in solution, but owing to their bitter taste they may produce vomiting. They can be given in the form of tablets so long as these are easily disintegrable. Subcutaneous injection finds few advocates. Intramuscular injection should only be resorted to in those cases where administration by the mouth is not desirable or possible, as it is liable to produce serious local disturbances, such as necrosis of muscles and involvement of nerves. The intravenous method should only be used for severe and urgent cases, where the patient is comatose, or very gravely ill, and an immediate response is necessary. These parenteral methods should not be used for routine administration of these drugs, but any evidence of impending cerebral malaria is an imperative indication for treatment by a parenteral route.

On the acute symptoms of the primary infection, quinine has a definite action, from the third day onwards (second paroxysm of fever) in benign tertian, but in malignant tertian malaria its action is less rapid, and in the case of some strains symptoms may continue until the fifth dose (third or fourth paroxysm).

As regards the time of administration of these alkaloids by the oral route, it is advisable to give them 2½ to 3 hours after the meal when the gastric contents are acid, the digestion has been completed, and the stomach is nearly empty. If given at this time they rapidly mix with the contents of the stomach and pass into the small intestine from where they are quickly absorbed into the circulation. There is less liability of their irritating the stomach if administered in this way.

Dosage.—Experience shows that in the case of Indian strains of malaria, a 5 to 7 days' course of treatment with 20 to 25 grains of the alkaloids daily is effective. Larger doses are not only wasteful, but may be harmful. According to the Fourth General Report of the League of Nations, 0.5 gramme of quinine hydrochloride sometimes causes a temporary disappearance of trophozoites of benign tertian and quartan infection, but a mean daily dosage of 1 gramme for 5 to 7 days is often necessary to cause the trophozoites to disappear, and not to make their reappearance in the peripheral blood after a latent period of varying lengths. In malignant tertian malaria 1.3 gramme produces analogous results. It is also agreed that definite advantage is obtained by combining them with alkalies.

(B) *Preparations containing cinchona derivatives*

During recent years a number of cinchona derivatives have been used in the form of proprietary remedies whose composition is secret. Various claims have been made for these, amongst others, that they have destructive action on both the sexual and asexual forms of all species of plasmodium, that they prevent relapses, and that they have prophylactic value. A number of preparations are on the market and we have tested some of these. Our observations show that their action is practically the same as that of cinchona alkaloids, they have no direct action on the gametocytes of malignant tertian, they do not prevent relapses, and have no effect on the sporozoites. Being proprietary remedies they are more expensive than the non-proprietary preparations of the cinchona alkaloids.

The following are some of the preparations in use :—

Malarcan.—Malarcan is said to be a compound of a stereo-isomeric base of methyl-acridinium chloride and hydrocholic acid. It is thus probably a derivative of quinine or quinidine.

Tebetren.—Tebetren is described as methyl hydro - cupreine-methyl-acridine-dihydrocholate, *i.e.*, a compound in which quinine is combined with acridine (from which atebrin is derived).

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Paludex is a complex organo-metallic preparation containing copper joined to an oxy-quinoline group. Chemically paludex is cupro-oxy-quinolin sodium sulphonate, and contains 8.37 per cent of metallic copper. It is a greenish amorphous powder, readily soluble in water, forming a solution which is neutral in reaction and stable under ordinary conditions.

Plasmodex is a similar compound, containing copper in a larger proportion.

Esanofele.—This is a proprietary preparation containing 0.1 gm. of quinine bisulphate, 0.001 gm. of arsenious acid, 0.3 gm. of iron citrate, and some bitter principles. If given as recommended, it contains less quinine than the usual minimum dose for effective therapy, specially against malignant tertian infection.

(II) Other anti-malarial remedies

Other anti-malarial remedies, which include the synthetic anti-malarial drugs.

These compounds can be divided into two groups :—(1) those that act like the cinchona alkaloids on the asexual cycle, *e.g.,* atebrin, and (2) those whose main action is on the sexual cycle, particularly of the malignant tertian species, *e.g.,* plasmochin.

Neither of these compounds acts on the sporozoites injected by the mosquito and therefore they have no true prophylactic value. They do not prevent relapses though their action in this respect is said to be more powerful than that of the cinchona alkaloids.

Their dosage as compared with the cinchona alkaloids is much smaller, but they are considerably more toxic.

(1) *Plasmochin.*—The shortage of quinine supply during the war led to experiments at Bayer-Meister-Lucius Research Laboratory at Elberfield with the object of finding a synthetic drug which could be used in its place. Schulemann and his colleagues chose methylene blue for investigation; they prepared a large number of compounds which were tested on canaries infected with *Plasmodium relictum.* Among these compounds they found one which was particularly effective, and this was an amino-quinoline derivative in which a basic aliphatic radicle was united to a quinoline nucleus by a connecting link of nitrogen. This compound was modified in many ways, and eventually the compound, first known as 'beprochin' and afterwards as plasmoquin, or *plasmochin,* was produced. It was at first thought to have a definite curative effect in the treatment of all forms of malaria, but later experience showed, that while it was effective in comparatively large doses (which often produce toxic effects) in curing the benign tertian and quartan malaria, in sub-tertian malaria it was of no therapeutic value because it had no action on the schizonts, and some observers went so far as to say that it had a provocative action. It, however, possesses the remarkable and unique property of destroying the crescents in the peripheral blood.

On account of this peculiar property of damaging the gametocytes it renders them non-infectious to mosquitoes. Even such small doses as 0.01 or 0.02 gramme of plasmochin daily are effective in this respect. This remarkable effect against the more resistant form of the parasites is the greatest virtue of the drug.

It should be fully appreciated that plasmochin is a drug which is likely to give rise to toxic effects and it should not be used for routine treatment of malaria. It can be given in combination with quinine, and it is claimed that this combination is more effective than quinine and the number of relapses is decreased. Prolonged administration of this combination in therapeutic doses is likely to produce toxic effects, but these are not so marked as when plasmochin is given with atebrin. Thus, plasmochin by itself holds a minor place in the symptomatic treatment of malaria.

Cilional.—The toxic effects produced by plasmochin have been fully appreciated by the workers of Bayer's Scientific Laboratories and they have been busy in producing less toxic compounds. Cilional is one of these compounds, which has been recently introduced, and which according to preliminary experiments was not only more effective than plasmochin but was considerably less toxic. Trials on human beings show that this compound is certainly less toxic than plasmochin, but it is not so effective unless larger doses are given. The work at the Calcutta School of Tropical Medicine has shown that this certainly is the case with the gametocytes of the Indian strains of *P. falciparum.*

Atebrin.—The work of Schulemann and his colleagues at Elberfield, which culminated in the synthesis of plasmochin, was continued by Mietzsch and Maus. More than 1,200 compounds were prepared and eventually the drug, originally called 'erion' and now known as 'atebrin', was produced. Chemically it is the di-hydrochloride of an alkyl-amino-acridine derivative, and is a yellow powder with a bitter taste. Its solubility in water is 1 in 14 and it forms a neutral fluorescent solution. The action of atebrin is very similar to that of quinine, but according to some workers it is more effective than quinine in reducing the number of relapses. None of these drugs by themselves or in combination (*e.g.,* atebrin and plasmochin, or quinine and plasmochin) represents a *therapia magna sterilisans.* Chopra and his co-workers (1933) tested this drug on the Indian strains of malaria and have come to the following conclusions :—

(1) Atebrin is an effective drug in the treatment of Indian strains of malaria. Its destructive action on the asexual forms of benign tertian, malignant tertian and quartan types of malaria is about equal, the schizonts disappearing from the peripheral circulation after 0.6 to 0.9 gramme of the drug.

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(2) The sexual forms or gametocytes are more slowly acted upon than the asexual forms. The gametocytes of the benign tertian and quartan types are readily destroyed. The gametocytes of the malignant tertian type are not affected at all.

(3) The drug is effective in doses of 0.1 gramme three times a day, the course lasting for five days, making a total of 1.5 gramme of the drug for the cure. The drug can be given intravenously in doses of 0.1 gm. to 0.3 gm. dissolved in 1 to 2 c.cm. of distilled water, when the number of parasites in the peripheral blood is large.

(4) In chronic types of malaria the drug is effective and produces a rapid reduction in the size of the spleen.

(5) Atebrin has earned a great reputation as a powerful remedy in preventing relapses in all species of human malaria. In view of clinical evidence, the drug would appear to be more powerful than quinine in curing malaria, but so far as prevention of relapses is concerned this is not our experience with Indian strains of malaria.

Atebrin musonat.—This form of atebrin has come into prominence through trials made during the recent epidemic in Ceylon. It is simply an improved form of a soluble atebrin salt suitable for injection, 0.3 gramme of atebrin being contained in 0.375 of the musonate. Hecht has shown that when atebrin is administered by mouth much of it is retained in the upper intestine, liver and bile, and only the overflow goes to the peripheral circulation after these organs are saturated. This exceptionally high concentration of atebrin is responsible for the manifestation of toxic symptoms. By means of injection the drug gets into the circulation quicker and gives a response earlier. Doses from 0.1 to 0.375 gramme are given and a single injection often produces remarkable effects on the clinical symptoms, but recrudescence usually occurs in a few days. Two injections on successive days, however, usually prove sufficient to control the temperature within 48 hours, and in four days all forms of benign tertian parasites and the ring forms of malignant tertian are destroyed. Crescents are not affected and must be destroyed by plasmochin. The intravenous route can be used, but this method apparently produces no quicker response than does the intramuscular, and by some is not considered free from risk. The drug though quickly absorbed is quickly excreted, and relapses are said to be more frequent with intravenous injections.

It has been reported that some cases of malaria fail to respond to quinine and are controlled by atebrin and *vice versa*. This may be due to a number of factors which interfere with the proper absorption of these drugs. The parasiticidal effect of neither of these drugs is immediate and takes a certain time to manifest itself.

Toxic effects of atebrin.—Atebrin, even in therapeutic doses, produces yellow staining of the skin which may take weeks to disappear. It may also occasionally produce headache, abdominal discomfort or colic, but cyanosis that may follow plasmochin administration is not seen. There appears to be no doubt that cases of psychoses of various forms and other cerebral complications have been associated with its use.

Relapses and prophylaxis.—Quite a large number of malarial patients get relapses, which occur within a few weeks to a few months after treatment, whether quinine or atebrin is used. Relapses are said to be less common with the synthetic drugs than with the cinchona alkaloids, but neither of these drugs completely eradicates the infection. Although they have remarkable parasiticidal powers over the asexual forms, the forms that produce clinical manifestations of the disease, their action on the gametocytes is much feebler, and on the sporozoites negligible. As regards sporozoites there is evidence to suggest, in bird malaria, that there may even be a further cycle in the vertebrate host, and that sporozoites may not all directly give rise to asexual forms in the blood, but may undergo a schizogonic cycle of their own in the cells of the reticulo-endothelial system. In this form, unharmed by drugs, they may exist as a reservoir from which the blood may get subsequently re-infected and produce clinical relapse. This has not yet been demonstrated in the case of human malaria.

The reason why a daily dose of quinine is often suggested as a prophylactic, when its action on the sporozoites is negligible, is that although quinine and atebrin may not be lethal to sporozoites, their presence in the blood tends to suppress the multiplication of asexual forms and so inhibits clinical manifestations. For prophylaxis 5-grain doses of quinine daily, or larger doses at correspondingly longer intervals, have been used. Some use 0.3 gm. of atebrin weekly, but with this drug it is difficult to strike a balance with a dose which is effective and yet which is free from undesirable effects.

Atebrin and plasmochin combination.—As atebrin only acts on the asexual forms of the malignant tertian parasite, it has been combined with plasmochin. A comparative study of the action of atebrin and an atebrin-plasmochin combination on Indian strains of malaria by Chopra and co-workers (1936) showed that, (1) in cases of benign tertian and quartan malaria the combination of the two drugs is not more effective than atebrin alone in so far as the time of disappearance of the parasites from the blood is concerned, (2) in case of malignant tertian infection, however, the combination appears to be more effective and the parasites disappear more rapidly from the peripheral circulation, (3) with regard to the relationship between the number of parasites and their disappearance from the peripheral circulation, atebrin alone and atebrin-plasmochin combination behave in the same way, (4) the relapse rate

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is definitely lower when the combination of the two drugs is used, and (5) the combination of the two drugs is more toxic.

It is therefore recommended that in those cases where crescents are present a 3 days' course of plasmochin 0.01 gramme, twice daily, be given after the course of atebrin is completed. The toxic effects are thus eliminated.

Anti-malarial drugs in ape malaria

A few words may be said about the action of these drugs on ape malaria. It has been shown that *P. knowlesi* produces a very intense and virulent infection in *Silenus rhesus*, causing death of the animal if untreated. This plasmodium appears to be more closely related to that occurring in man than plasmodia occurring in birds, which are usually used for testing anti-malarial drugs. The results obtained should therefore be more readily applicable to man. Chopra and Das Gupta (1933) showed that the destructive action of atebrin on *P. knowlesi* was exceptionally powerful. Usually two doses of 0.025 gramme of the drug given intramuscularly or intravenously are sufficient to control a very heavy infection, which may amount to a million parasites per c.mm. of blood. The drug affected equally the schizogony and the gametogony. Owing to its slow excretion, atebrin appears to exert a more prolonged action than quinine, and atebrin is successful in checking a heavy infection whereas quinine may not be. It was, however, shown that even after 5 days' intensive treatment with atebrin, the parasites invariably reappeared in the monkeys in 10 to 15 days and multiplied with the same rapidity as in the previous attack, causing death of the animal if prompt treatment was not given. The recrudescence can, however, be checked more easily, one dose sufficing to control the multiplication of the parasites. After this a low grade of infection persists for long periods, the parasites losing their virulence. Compared with atebrin, quinine, according to Chopra and Das Gupta (1934), has a much less powerful immediate effect on these parasites. When the parasite count is low, *i.e.*, below 100,000 per c.mm., one dose (intramuscular or intravenous) may be effective in controlling the infection, but, when the parasite count is higher, 2 or 3 injections are necessary to control the infection. Further, the first effect of injection may be an actual increase in the number of the parasites. The advantage of quinine is that relapses rarely occur after the treatment of the primary infection, and, even when they do occur, they are not often fatal. The action of quinine thus appears to be slower, and if the treament is started at a time when the infection is moderately heavy, the infection does not seem to be affected, in most cases, in 24 hours or even longer with quinine, whereas with atebrin, even if treatment is started late, *i.e.*, when the count exceeds half a million parasites per c.mm., this invariably falls to a negligible number.

Stimulated by the results of these experiments, further work has been carried out on the concentration attained by these drugs in the circulating blood at different intervals of time in relation to the parasite count. With regard to quinine, Chopra, Ganguly and Roy (1935) have shown that there is no direct relationship between the concentration of quinine in the blood and the parasite count at any particular time. The highest concentration of the alkaloid attainable without producing toxic effects caused no apparent reduction in the number of parasites nor degenerative changes in them. The action of quinine thus appears to be synergistic to other defensive mechanisms set up in the body. In therapeutic doses quinine augments these processes, or possibly it acts on the parasites in such a way as to render them more vulnerable or unable to propagate. Studies on the concentration of atebrin in the blood by Chopra, Ganguly and Roy (1936) show that the highest concentration of atebrin occurs between half an hour and six hours after the injection of atebrin. The number of parasites per c.mm. of blood distinctly diminishes in the majority of cases in the first 6 hours when the concentration of atebrin in the blood is highest. Within 24 hours the parasites are reduced to a negligible number, in spite of the rapid falling off in the concentration of atebrin. It is, therefore, reasonable to state that atebrin, unlike quinine, has probably some direct lethal action on *P. knowlesi in vivo*. This has been further confirmed by Chopra, Das Gupta and Roy (1936), who showed that atebrin solution in a dilution of 1 in 50,000 *in vitro* is capable of destroying the parasites even when the infection is heavy. The smears of blood, which were kept in contact with atebrin, showed degenerative changes in the parasites. This work is being further elaborated.

Three important points which have come out of this work are :—

(1) Atebrin has a more powerful and more rapid effect on *P. knowlesi*. Whereas quinine takes 24 hours to produce its effect, atebrin is effective in 6 hours and concentration of this drug runs parallel with the decrease in the number of the parasites.

(2) Atebrin has some direct action on *P. knowlesi* (in 1 in 50,000 concentration), quinine has not. In fact the first effect of quinine administration may be actual stimulation of multiplication of parasites.

(3) A fatal relapse is more common after atebrin than after quinine. The action of quinine, though less powerful and less rapid, appears to be more prolonged and lasting.

Whether all these facts are applicable to human malaria remains to be seen.

Cinchona alkaloids versus *synthetic anti-malarial drugs*

What is going to be the effect of the introduction of these powerful synthetic anti-malarial drugs on the cinchona alkaloids ? Are these

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veterans going to be entirely replaced by the new-comers ? The Malaria Commission of the League of Nations has rightly pointed out that neither of the two groups is the *therapia magna sterilisans*, and that their effect in preventing relapses is not marked. They have also no true prophylactic action. The synthetic drugs, according to the Commission, are not to be regarded as 'substitutes for quinine but as additional weapons for use in particular circumstances and for special purposes'.

This, I have no doubt, is the correct point of view. The cinchona alkaloids have a very low degree of toxicity, and can be used with impunity in the mass treatment of malaria, even for self-medication, without any danger. The same cannot be said about the synthetic anti-malarial drugs. They have a high degree of efficacy combined with some toxicity and should always be used under proper medical supervision. Even under such conditions, toxic effects are sometimes met with. Unless further researches produce less toxic drugs—and I may say that efforts are being made in this direction —cinchona alkaloids will hold the field for treatment of malaria generally.

During the last few years, it has been debated whether the cinchona plantations in this country should be extended. One of the arguments brought forward against their extension is that in view of the rapid development of synthetic anti-malarial drugs there will be no further necessity for cinchona alkaloids. I personally feel no hesitation in saying that unless something extraordinary happens, for the next 15 to 20 years we shall have to use the cinchona alkaloids in our struggle against malaria in India. The cinchona plantations take 7 to 8 years to mature and if we wish to extend the treatment of malaria among the masses, which is one of the chief methods of eliminating this disease, it is very desirable that cinchona plantations should be extended till such time as an effective and harmless synthetic drug is available, which can be used for mass treatment of malaria without any special supervision.

In Formosa large areas have been put under cinchona plantations, and in a few years' time Japan will be able to meet all her own requirements. In India large scale and economic production should be taken in hand, now that information is available regarding the species of cinchona which yield the highest percentage of the alkaloids, and the best soil for cultivation. It may be ten years before India, even if she starts work at once, can hope to produce all cinchona alkaloids her population needs, but in the meantime it should be possible to overhaul the existing resources. It is a health rather than a fiscal problem.

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EARLY OPHTHALMOLOGISTS IN CALCUTTA*

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Professor of Ophthalmology, Medical College Hospitals, Calcutta

DURING the regime of the Honourable East India Company the first properly organized hospital, the Calcutta General Hospital, was established in 1790 in Calcutta. This was followed in 1792 by the opening of the Calcutta Native Hospital. The former is now represented by the present Presidency General Hospital, the latter was rebuilt and re-named and is now the present Mayo Hospital which was opened in 1874. The Calcutta Native Hospital appears to have been the first institution to provide scientific treatment for diseases of the eye, and even to this day, in spite of many other hospitals for the treatment of eye diseases, the Mayo Hospital still has the reputation among the inhabitants of Bengal as a place from which blind persons return with their sight restored.

Dr. John Shoolbred was the first surgeon and superintendent of the Calcutta Native Hospital and remained in charge of that institution from 1792–1816. In the year 1798 he published, in the annual transactions of the hospital, the treatment of two cases of cataract, twenty cases of phlegmon of the eyes and thirty cases of ophthalmia. He does not, however, give an account of the details of treatment. The number of eye cases reported in the annual hospital transactions steadily increased from year to year. He held the appointment of superintendent and surgeon to the Calcutta Native Hospital through his whole service, till he went on furlough in 1818 prior to retirement, with two intervals, one of furlough and the other when he acted as superintendent general of vaccination in 1806–1807.

Dr. Shoolbred obtained the Certificate of Surgeons in 1785, and served as surgeon of the Indiaman 'General Goddard' in 1789–90. He was commissioned as assistant surgeon in 1794, became surgeon in 1807, retired in 1821 and died in 1831.

Official records dated October 1816 show that operations for the relief of blindness, including cataract, were first done in Calcutta by Surgeon Thomas Luxmore. He applied to the Right Hon'ble the Governor-General in Council for a grant and an allowance for the upkeep of the small hospital he established in Chowringhee in 1816, and pointed out that the various opportunities he had in performing the operation of cataract had afforded him the pleasing gratification of rendering the operation so successful as generally to restore the sight of those who were blind from any species of cataract, from the infant born in that state to the adult in the advanced period of life, provided there was no other defect in the organs of sight. He mentions that

* Reprinted from the *British Journal of Ophthalmology*, December, 1937.

(*Continued from previous column*)

Chopra, R. N., and Das Gupta, B. M. (1934). *Indian Med. Gaz.*, Vol. LXIX, p. 195.

Chopra, R. N., Das Gupta, B. M., and Roy, A. C. (1936). *Ibid.*, Vol. LXXI, p. 710.

Chopra, R. N., Das Gupta, B. M., and Sen, B. (1933). *Ibid.*, Vol. LXVIII, p. 425.

Chopra, R. N., Ganguly, S. K., and Roy, A. C. (1935). *Ibid.*, Vol. LXX, p. 62.

Chopra, R. N., Ganguly, S. K., and Roy, A. C. (1936). *Ibid.*, Vol. LXXI, p. 443.

Chopra, R. N., Gupta, J. C., and Sen, B. (1936). *Ibid.*, Vol. LXXI, p. 309.

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Drs. Cochrane and Leny, of the Medical Board, Bengal, inspected minutely the cases of cataract in his hospital and were pleased with the results of the new mode of treatment. The Governor-General in Council, the Right Hon'ble Francis, Earl of Moira, K.G., sent in the application of Dr. Luxmore to the Medical Board in Calcutta asking if an institution could be established for boys from the Orphan and Free Schools to be instructed by Dr. Luxmore in the mode of extracting cataracts, and in the treatment of other diseases of the eye. Dr. R. Leny, secretary of the Medical Board, replied that the Medical Board was of the opinion that no advantage could be gained from instructing young men from the Orphan and Free Schools in the mode of performing the operation for the cure of cataract and for the treatment of other diseases of the eye. From the delicacy as well as the complicated structure of the organ not only are the operations to be performed on it of a fine and difficult nature, but the proper treatment of its diseases requires an extreme range of knowledge. It appears, therefore, more necessary in respect to the eye, more than perhaps any other organ of the human body, that its professional management should be confined to persons better informed and more skilful than boys from the Orphan and Free Schools. It is likewise proper to remark that boys could not at present be furnished for such a purpose by these establishments, for a number of boys, not less than fifty, is now required for completing the new hospital establishment and a very small proportion of them can be supplied.

The matter was referred to Dr. John Shoolbred, the surgeon superintendent of the Calcutta Native Hospital, as to whether he considered a ward contiguous to the Native Hospital, could with advantage be constructed for the reception of natives affected with cataract and other diseases of the eye. He replied that, as there were prejudices amongst many patients remaining as indoor patients, there was no necessity at present, as cases of cataract and other chronic affections of the eye requiring operation, so long as they were not contagious and could remain in the common ward without danger to anyone, could be accommodated in some of the spare cots which were always available in the hospital. He also was of the opinion that before the new ward was erected exclusively for diseases of the eye the necessity for it should be satisfactorily established by experience, and this could easily be done if the surgeon in charge of the hospital were directed to keep a register of eye patients for 12 months, separate from that of other patients, and to ascertain by this means how many cases of diseased eyes in that period would require or derive benefit from such separate accommodation, and how many would avail themselves of it were it offered to them. If the number of the latter were sufficient to warrant the expense of an additional ward, it would then be time enough to erect it. If not, eye cases would, of course, continue to be received as they have hitherto been as house or out patients at their own option, when not improper to mix with others, for any idea of compelling them to remain in hospital contrary to their own wish would be the certain means of deterring many from applying for relief at the hospital, who might otherwise have derived benefit from it, both in these and other complaints. The first separate account of eye patients submitted was from 1st September, 1816 to 31st August, 1817. In the Government Gazette dated 19th December, 1816, the following appears: 'A person blind received sight by the means of a surgical operation performed by Dr. Luxmore, who removed a cataract which was the cause of blindness'.

Dr. Thomas Luxmore was born 13th March, 1774. Assistant Surgeon 8th September, 1815, M.R.C.S., 1820, surgeon, 23rd May, 1825. Died at Lucknow, 2nd October, 1828.

In 1825, Mr. Surgeon Breton, superintendent of the Calcutta Medical Institution, presented to the governors of the Native Hospital a tract on the eye and its appendages and another on cataract, for the use of the assistants at the Native Hospital and its subsidiary dispensaries. These were written in Hindustani, in the Persian and Nagree characters and were intended for the use of the students of the Native Medical Institution in Calcutta. These tracts were printed in lithography. The Calcutta Medical Institution was founded in 1822 and Surgeon Breton was the second superintendent. As superintendent of the Native Medical Institution he taught the senior students the native mode of operating for cataract, as he was convinced by positive proof that this method, on account of its extraordinary simplicity and efficacy, was the safest for the students to adopt. It is on record that a Mussalman practitioner operated successfully on eleven patients in his presence. In 1826 he wrote an article on the native method of couching. He was an author of repute. In the annual records of the Calcutta Native Hospital from 1816 onwards mention is made of cases of cataract admitted for treatment. Eye diseases were classified under four headings, *viz*, nyctalopia, cataract, phlegmon of the eyes and ophthalmia.

Dr. Peter Breton was appointed assistant surgeon on 27th August, 1801, and surgeon on 22nd August, 1814. He gave up promotion to superintending surgeon to retain his appointment of superintendent of the Native Medical Institution in 1826. He died in Calcutta on 18th November, 1830.

When Dr. John Shoolbred resigned the post of surgeon and superintendent of the Calcutta Native Hospital in 1816 he was succeeded by Dr. Simon Nicolson. Crawford says of Nicolson, he was the best known medical man of his time in Calcutta, perhaps, he might say, of any time. He was born on 5th July, 1779, in the Manse of Kiltarlity, Inverness, Scotland, of which parish his father was minister, and he was educated at St. George's Hospital, London, where he was house surgeon in 1801, and M.R.C.S. in 1802. He was assistant to Sir Everard Home in private practice until 1805 and was succeeded in that post by Sir Benjamin Brodie, when the post fell vacant through Nicolson's acceptance of an appointment in India. He was appointed to the Madras Medical Service in 1806, but never joined that Presidency, being gazetted to the Bengal Medical Service as Assistant Surgeon in the Calcutta General Hospital. Except for one period of leave to the Cape, he spent the rest of his service and life in Calcutta. From 1807 to 1816 he served in the Calcutta General Hospital and in 1816 he succeeded Dr. John Shoolbred as superintendent and surgeon of the Calcutta Native Hospital, and during his time the number of eye cases treated in the Calcutta Native Hospital steadily increased from year to year. Unfortunately the annual reports show no details of treatment. In the records his name appears frequently as being associated with the teaching of students in the diseases of the eye. He and Dr. James Ranald Martin were amongst other examiners in the first final examination for the diploma issued by the Medical College, Calcutta, in 1838. At this examination eleven students presented themselves and four passed. He retired from the post of surgeon and superintendent of the Calcutta Native Hospital in 1830 on the grounds of ill health, and was appointed a Governor of this Hospital by the Governor-General in Council, on the recommendation of the Board of Governors of the Calcutta Native Hospital in appreciation of his work for that institution. Early in 1883 he went on two years' leave to the Cape. On his return in 1835 he was posted as surgeon to the Calcutta European Hospital and held that post till he died twenty years later. In 1839 he was gazetted superintendent surgeon but was allowed to decline promotion and to retain his appointment in Calcutta. He retired on 1st August, 1855, and died in Calcutta a week later on 8th August, 1855, at the age of 76 years.

It was Nicolson who first brought James Ranald Martin into notice, recommending him in 1823 to the Governor-General, Lord Amherst, to be sent to Hyderabad to treat Sir Charles Metcalfe, the Resident there, who was seriously ill. In 1830 Martin succeeded Nicolson as superintendent and surgeon of the Calcutta Native Hospital. He also took charge of Nicolson's practice while he was at the Cape.

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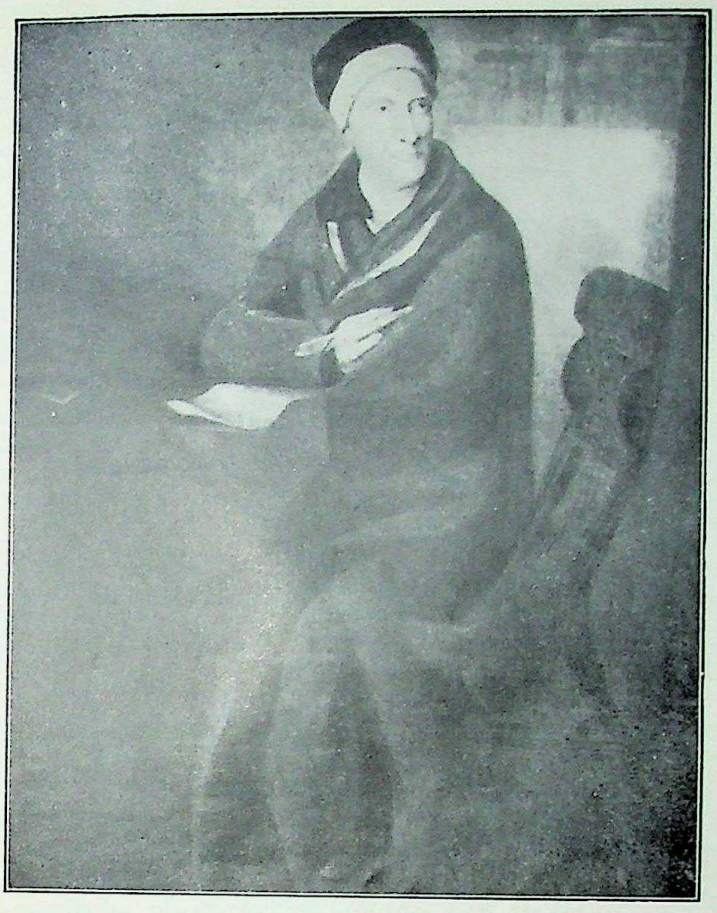

Dr. Simon Nicolson, 1779–1855.

Dr. C. C. Egerton. 1798—1885.

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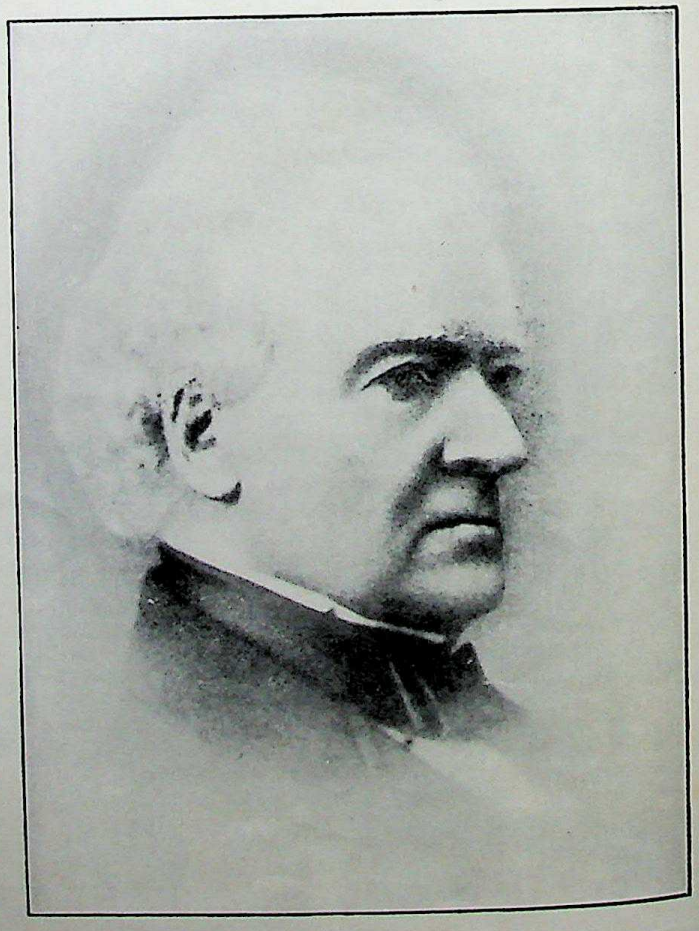
James Ranald Martin, Surgeon, Governor-General's Bodyguard, 1821.



Sir James Ranald Martin. 1870

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Nicolson left no published works and nowadays he is almost forgotten, a mere name, but no officer in the Indian Medical Service ever stood higher in the public and private estimation of his contemporaries. Sir John Kaye has described him under the name of Nicholas Fitzsimon in a long-forgotten novel 'Peregrine Pulteney'. A retired Bengal civilian in the novel speaks of him as follows: 'Nicholas Fitzsimon, everybody knows him in India—finest fellow in the world—kind, generous, trump of a fellow. Now I'll tell you, go to him—give you breakfast, tiffin, dinner, shelter, advice, everything. If you are sick, go to him, sure to cure you—sure to be kind to you—saved more lives than the invention of the lifeboat—a most excellent fellow—good Samaritan—sure to love him'.

A picture of Nicolson, seated in a chair, hangs in the rooms of the Calcutta Asiatic Society and a photograph of this painting is published with this article.

The late C. R. Wilson, in his *Descriptive Catalogue of Paintings in the Possession of the Asiatic Society of Bengal*, quotes two other references to Nicolson, which should be reproduced here. 'His practice was only limited by the impossibility of performing more than a certain amount of work within a certain space of time. One carriage was always kept waiting, day and night, to enable him to attend to any call without delay.'

In accepting his resignation, the Governor-General, Lord Dalhousie, wrote to him as having long possessed: 'In a measure rarely equalled, the confidence and reverence of your professional brethren, the universal respect and esteem of the community amongst whom you have passed your days and the approbation and gratitude of the Government, to whose service you devoted a long course of valuable labours'.

Dr. Simon Nicolson was succeeded in 1830 as surgeon and superintendent of the Calcutta Native Hospital by Dr. James Ranald Martin, one of the greatest medical men of his time in India, and in the annual records of the Mayo Hospital mention is made of large numbers of eye cases that were treated during his time as surgeon and superintendent, and it is of interest to know that the earliest official records of glaucoma in Calcutta are found in the old records of the Calcutta Native Hospital in 1830, in the year that Martin succeeded as surgeon and superintendent of that institution. In that year James Ranald Martin records the treatment of four cases of sudden acute inflammation of the eyes with widely dilated pupils and included these in a list of 113 cases of ophthalmia, as at that time all inflammatory diseases of the eye were still classified under the general heading of ophthalmia. Definite mention of glaucoma treated by operation is found in the records of the department of ophthalmology of the Calcutta Medical College when Dr. Archer was the surgeon in charge, 1858–1870. The number of eye cases coming for surgical relief for glaucoma in those days was few, and the popular belief was that operation on a glaucomatous eye was of no benefit except perhaps to allay pain. In the year 1835 the Calcutta Medical College with its associated hospitals was established and in the records of these institutions the earliest eye work mentioned was in 1840 and the name of Dr. Martin is associated with it. He was the first part-time professor of ophthalmology at the Medical College, Calcutta. He was the first to practise injections of iodine in the cure of hydrocele. A ward in the original Medical College Hospital, which was erected in 1848, was called the Martin Ward, to commemorate his services to humanity in Calcutta.

In 1839 he resigned the office of surgeon and superintendent to the Calcutta Native Hospital and the Governors of that institution expressed themselves as follows: 'The Governors feel great regret at being called upon to accept your resignation, and particularly at the cause which has led to your retirement; at the same time they feel deeply sensible of the valuable services you have rendered to the institution over which they preside, of the great professional skill which for a period of more than nine years you have displayed in attendance on the native sick entrusted to your care, and of the zeal and ability you have constantly shown in offering numerous and important suggestions for the improvement of the institution over which you were placed'.

To the Governor of Bengal they wrote: 'We take leave on this occasion to lay before you, Honourable Sir, copies of our correspondence with Mr. Martin, in the belief that it will be a source of satisfaction to Government, contributing as it does largely to this charitable institution, that it should be informed how very highly we appreciate the past services of Mr. Martin'.

His friends and patients, at a meeting presided over by Sir John Peter Grant in the Town Hall, presented him with an address signed by over one hundred of the leading inhabitants, European and native, of Calcutta, and a gift of plate to the value of four hundred guineas.

On retirement from India in 1842 James Ranald Martin rapidly became a prominent figure in the medical world in England. He was appointed a member of the Health of Towns Commission, and to him is due one of the most valuable appointments that was ever made in England, that of medical officer of health. He sat on the Royal Commission to enquire into the conditions of the Royal Army Medical Department and was instrumental in founding the Army Medical School at Netley. His labours so benefited the Army that James Ranald Martin was widely spoken of as the soldiers' friend. His whole life was one of activity and usefulness and, whether in his public capacity or later in life in the private exercise of his profession, he was noted for the wisdom and judgment which he manifested and for the influence for good which he exercised on all with whom he was brought into contact. The Martin Memorial Gold Medal, presented to the surgeon on probation who takes the highest place in military medicine at the Royal Army School at Millbank, London, at the close of each session, was created to commemorate his memory in advancing the science of tropical medicine and sanitation in India and at Home, with the inestimable result of improving the health and diminishing the death rate of the Army in India.

James Ranald Martin was born on 12th May, 1796, and was a pupil of Sir Everard Home, as well as of Sir Benjamin Brodie at St. George's Hospital, London. He was appointed assistant surgeon, Indian Medical Service, Bengal establishment, on 5th September, 1817. Surgeon to the Bodyguard of the Governor-General, 1821–1826. Surgeon to the Governor-General, 1828, and Surgeon to the garrison of Fort William, 1828. Appointed Surgeon of the Calcutta Native Hospital, 1830. Retired, 1842. Elected F.R.C.S., 1843. F.R.S., 1845. Appointed examining Physician to the Secretary of State for India, 1859–1864. C.B., 1860. Knighthood, 1860. President, Medical Board, India Office, 1864 (when the Board was first formed) to 1874. Died in London on the 27th November, 1874. Author of 'Medical Topography of Calcutta', 1830. Article on 'Hospitals in Holmes' System of Surgery', 1864.

In the *History and Traditions of the Moorfields Hospital* by Treacher Collins, mention is made that in 1824 Mr. C. J. Egerton, who had studied ophthalmology under Travers in the London Eye Infirmary, was sent to Calcutta, where he founded an Eye Hospital. This must be Charles Chandler Egerton, who was appointed to the I.M.S. as Assistant Surgeon in 1823. The eye hospital which was formerly situated at the junction of Wood Street and Theatre Road, Calcutta, on the present site of the Saturday Club and mentioned in old records, was probably started by him, but his name does not appear as holding a prominent position in ophthalmology. Bengal Civil Order No. 33 of 1st February, 1837, shows that Assistant Surgeon C. C. Egerton was appointed Professor of Surgery and Clinical Surgery to the Calcutta Medical College. He held that

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position until he went on furlough in 1842 and was succeeded by Surgeon E. W. W. Raleigh.

Charles Chandler Egerton was born in April 1798. Studied at Guy's and St. Thomas' Hospitals. M.R.C.S., 1819. Appointed Surgeon 1st August, 1837. F.R.C.S. (elected), 1844. Retired 31st January, 1847, and died in England on 4th May, 1885.

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Medical News

COLLEGE OF PHYSICIANS AND SURGEONS OF BOMBAY

REGULATIONS RELATING TO THE EXAMINATION * FOR THE DIPLOMA IN OBSTETRICS AND GYNÆCOLOGY.

1. The College of Physicians and Surgeons of Bombay shall grant a diploma in Obstetrics and Gynæcology † (D. G. O.).

2. The seal of the College shall be affixed to every diploma.

3. The examination shall be open to all those registered with the Bombay Medical Council ‡.

4. No candidate will be admitted to the examination unless he produces the certificates of having attended the following courses:—

For candidates who have passed the M.C.P.S. examination of this college or the M.B.B.S. examination of a statutory Indian University

Of having held, for a period of twelve months, a resident appointment in obstetrics and gynæcology, where appointments are combined; or

Of having held, for a period of six months, a resident appointment in obstetrics followed or preceded by six months in gynæcology, either resident or post-graduate, where appointments are separate.

The above appointments to include attendance at ante-natal and post-natal clinics.

For candidates who have passed the L.C.P.S. examination of this college or the licentiate examination of any faculty or board in India

(*a*) Of having held, for a period of six months, a resident appointment in either medicine or surgery, at a recognized hospital attached to an affiliated institution; or

Of having attended, for a period of twelve months, a post-graduate course in medicine and/or surgery, at a recognized hospital attached to an affiliated institution;

(*b*) Of having held, for a period of twelve months, a resident appointment in obstetrics and gynæcology, where appointments are combined, or

Of having held, for a period of six months, a resident appointment in obstetrics followed or preceded by six months in gynæcology, either resident or post-graduate, where appointments are separate.

The above appointments to include attendance at ante-natal and post-natal clinics.

5. The examination shall be written, practical, clinical and oral. There shall be two papers, each of three hours' duration, and each carrying 100 marks, in each of the following subjects:—

(*a*) Midwifery,

(*b*) Gynæcology and diseases of the newborn *.

There shall be practical and oral examination, including obstetrical operations on phantoms, carrying 100 marks, and clinical examination carrying 100 marks.

The examination will be very largely practical and is intended to test the student's knowledge of the practical side of obstetrics and gynæcology.

6. To pass the examination, the candidate must obtain 40 per cent of the full marks in each paper, 50 per cent of the full marks in practical, clinical and oral tests taken together, and 50 per cent of the full marks in the written, practical, clinical and oral tests taken together.

7. The examination shall be held annually in Bombay on the last Monday in August.

8. Candidates must apply to the Secretary of the College for permission to appear at the examination at least three weeks before the date of the commencement of the examination, and shall at the same time pay a fee of Rs. 100. Fees once paid shall not be refunded, but may be reserved for the subsequent examination only, at the discretion of the College Council, provided that the application for such reservation is made at least seven days before the date of the commencement of the examination, and good and sufficient reason is shown for the same. A candidate who fails to pass or to present himself at an examination may be admitted to one or more subsequent examinations on a fresh application being made and a fresh fee being paid.

9. The following hospitals are recognized for the D. G. O. course:—

Motlibai and Petit Hospitals, Bombay; Cama and Albless Hospitals, Bombay; Nowrosjee Wadia Maternity Hospital, Bombay, for midwifery only; King Edward VII Memorial Hospital, Bombay, for gynæcolcgy only; Sassoon Hospital, Poona; King Edward Memorial Hospital, Poona, for midwifery only; St. Margaret Hospital, Poona; Canada Hospital, Nasik; State General Hospital, Baroda; Civil Hospital, Ahmedabad; Wadilal Sarabhai and Chinai Maternity Home, Ahmedabad; Jamnagar State Hospital, Jamnagar; and Lady Dufferin Hospital, Karachi.

* The first examination under these regulations will be held in August 1939.

† Gynæcology will be included in the examination, only in so far as it is related to common diseases and to the complications arising from child bearing. Experience in, or a knowledge of, major gynæcological operations will not be required.

‡ Candidates shall at the time of applying for permission to appear at the examination produce a certificate stating that he is registered with the Bombay Medical Council.

SWINEY PRIZE FOR A WORK ON MEDICAL JURISPRUDENCE

THE council give notice that the next award of the Swiney Prize will be made in January 1939, the ninety-fifth anniversary of the testator's death. Dr. Swiney died in 1844, and in his will he left a sum of money to the Royal Society of Arts for the purpose of presenting a prize, on every fifth anniversay of his death, to the author of the best published work on jurisprudence. The prize is a cup, of a value of £100 and money to the same amount.

* The paper in gynæcology and diseases of the newborn shall include questions in diseases of the newborn, carrying 40 marks.

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The award is made by a joint committee of the Royal Society of Arts and the Royal College of Physicians, which appoints special adjudicators.

The prize is offered alternately for medical and general jurisprudence, but if at any time the committee is unable to find a work of sufficient merit in the class whose turn it is to receive the award, it is at liberty to recommend a book belonging to the other class. On the last occasion of the award (1934) the prize was awarded for general jurisprudence. It will, therefore, be offered on the present occasion for medical jurisprudence.

Any person desiring to submit a work in competition, or to recommend any work for the consideration of the Judges, should do so by letter, addressed to the secretary of the Society, not later than 30th November, 1938.

K. W. LUCKHURST,
Secretary, Royal Society of Arts.

JOHN STREET,
ADELPHI, LONDON, W.C.2.

BOMBAY MEDICAL COUNCIL

THE following extracts from a summary of the proceedings of the meeting of the Bombay Medical Council held on 14th February, 1938, are published for information:—

The council proceeded to consider further the application of Mr. G. S. Kasyapi, L.M. & S., for the restoration of his name to the Bombay Medical Register and resolved that his request be refused.

The council proceeded to consider the application of Mr. V. R. Kulkarni, L.C.P.S., for the restoration of his name to the Bombay Medical Register and resolved that his name be restored to the Register.

The council proceeded to consider the reply received from the Medical Council of India stating (1) that the suggestion made to them by the Bombay Medical Council, *viz*, that the Medical Council of India might request the Government of Portuguese India to allow all medical practitioners registered under the Bombay Medical Act, 1912, to practise in Portuguese India, related to a matter outside the scope of the Medical Council of India and (2) that any extension of local reciprocity should be negotiated by and at the discretion of the Bombay Medical Council, and it was resolved that the Government of Bombay be addressed with a request to reopen the question and press on the Government of Portuguese India to consider the advisability of permitting all medical practitioners registered under the Bombay Medical Act, 1912, to practise medicine in their territories on a reciprocal basis.

The council resolved that Government be requested to add the following proviso to clause (1) of section 3 of the Bombay Medical Act, 1912:—

'subject to the proviso that a member shall hold office for the term of five years from the date of his nomination or election or until his successor shall have been duly nominated or elected, whichever is longer'.

The council proceeded to consider the draft bill for the Registration of Dental Practitioners, together with the draft Bombay Presidency Dental Act prepared by the Bombay Presidency Dental Association, and decided that the matter be referred back to the Executive Committee for further consideration and with due regard to the decisions already taken by the council on certain points in respect of the former bill.

The council proceeded to consider an application received for the inclusion of the D.O.M.S. of the College of Physicians and Surgeons of Bombay in table (G) printed in the Bombay Medical Register—showing the qualifications registrable as additional qualifications—and it was decided to call for further information from the executive committee before disposing of the application.

The council proceeded to consider an application from the Registrar, Andhra University, for the recognition of the medical degrees of the Andhra University for registration under the Bombay Medical Act and resolved that Government be requested to add the degrees in question to paragraph 1 of the Schedule to the Act.

The council proceeded to consider further the draft bill to Prohibit the Conferment of Unauthorized Medical Degrees, etc., and Assumption thereof, and resolved that Government be informed that the council is in favour of the bill—which is practically on the lines of the draft bill to amend the Indian Medical Degrees Act, 1916, framed in 1927—subject to certain alterations suggested by them.

The council proceeded to consider further the proposal made by Mr. U. B. Narayanrao, L.C.P.S., and seconded by Mr. V. D. Sathaye, B.SC., L.C.P.S., for the amendment of section 2 of the Bombay Medical Act in respect of the number of members of the council to be nominated and elected and it was resolved to refer the matter back to the executive committee for further consideration and report on a point raised at the meeting re the reservation of seats for Sind.

The council proceeded to consider further the proposal made by Mr. U. B. Narayanrao, L.C.P.S., and seconded by Mr. V. D. Sathaye, B.SC., L.C.P.S., for the circulation of the draft revised Code of Medical Ethics to the medical press and medical associations in the Presidency with a view to obtain the views of the registered medical practitioners thereon and it was resolved that a short notice be published in the *Times of India*, the *Bombay Chronicle* and the *Sind Observer* and also the medical journals, if they will publish the notice free, stating that the Bombay Medical Council will welcome suggestions, etc., regarding the revision of the Code of Medical Ethics.

The council proceeded to consider further the proposal made by Dr. Jivraj N. Mehta, M.D. (Lond.), etc., and seconded by Dr. P. T. Patel, M.D. (Lond.), etc., suggesting certain alterations in the Bombay Telephone Directory and it was decided that Dr. Jivraj Mehta and the Registrar should discuss the matter further with the manager of the Telephone Company.

The council proceeded to consider and approved of a suggestion received by them that the names in the Bombay Medical Register should in future be shown together and not in two parts as at present.

The council proceeded to ballot for the election of an executive committee for the year and, in accordance with the result of the ballot, declared the following six members as duly elected:—

Lieut.-Colonel S. L. Bhatia.
Mrs. Cecilia D'Monte.
Dr. B. G. Vad.
Dr. P. T. Patel.
Mr. C. A. Amesur.
Mr. V. D. Sathaye.

The council proceeded to consider a motion made by Mr. C. A. Amesur, M.S. (Lond.), and seconded by Dr. P. T. Patel, M.D. (Lond.), etc., that 'the Bombay Government be moved to amend the Bombay Medical Act VI of 1912, empowering the Bombay Medical Council to register Indian and British Nationals by birth, who possess reputable qualifications which are not in the Schedule', and it was resolved that the matter be referred to the executive committee for consideration in the first instance.

The council proceeded to consider a motion made by Mr. U. B. Narayanrao, L.C.P.S., and seconded by Mr. V. D. Sathaye, B.SC., L.C.P.S., that in view of the desirability of having one uniform standard of medical education in India as accepted by the Health Ministers' Conference recently held at Madras, etc., the council should request Government to abolish Licentiates' course altogether, and it was resolved that the matter be referred to the executive committee with a request to examine it in all its aspects.

PUNJAB MEDICAL COUNCIL

ABSTRACT of proceedings of a meeting of the Punjab Medical Council held in the Committee Room of the

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Office of the Inspector-General of Civil Hospitals, Punjab, Lahore, at 11 a.m., on Saturday, the 9th April, 1938.

Proceedings

Notifications regarding the nomination of Col. G. G. Jolly, C.I.E., V.H.S., I.M.S., as president, and nomination of Dr. Hakim Din as a member, were read and recorded.

Notification regarding the election of Dr. Vishwa Nath, M.A., M.D., as a member of the Punjab Medical Council, was read and recorded.

Decided that Lieut.-Col. Amir Chand, I.M.S., be nominated to represent the Punjab Medical Council at the Conference called by the Director-General, Indian Medical Service in India, in November 1938.

Decided that the Sub-Committee appointed by the Punjab Medical Council at their meeting held on the 13th November, 1937, to revise the syllabus of the L.S.M.F. examinations, should function after the Conference in Delhi to be held in November 1938.

(*i*) Resolved that an Inspection Committee be appointed to inspect the Punjab Medical School for Women, Ludhiana, and to submit its report to the next meeting.

Resolved that (*i*) foreign nationals whose country of origin possesses no reciprocity relations with India on the basis of the Schedule of the Medical Council in the matter of medical registration, should be debarred from being registered as medical practitioners in the Punjab under the provisions of Section 13, proviso II (*a*) of the Punjab Medical Registration Act.

(*ii*) Foreign nationals whose country of origin possesses no reciprocity relations with India on the basis of the Schedule of the Medical Council of India in the matter of medical registration, should be debarred from being registered as medical practitioners in the Punjab under the provisions of Section 13 (*a*) of the Punjab Medical Registration Act.

'Resolved that Government be requested to so amend the Indian Medical Degrees Act of 1916, as to make it more effective against the assumption and use of medical degrees, licences, etc., by unqualified persons.

'Resolved that the registration fee charged by the Punjab Medical Council be reduced from Rs. 32 to Rs. 15.'

Resolved that the Punjab Medical Council views with disfavour the practice of a registered medical practitioner associating with professions other than his profession as a medical practitioner.

Resolved that the recommendations of the Registration Sub-Committee be accepted with the following amendments:—

Applications of the following American doctors be not approved as their qualifications are not borne on the Schedule of the Punjab Medical Council:—

Dr. E. S. Kirkman.
Dr. E. F. Farra.
Dr. Rose A. Riste.
Dr. S. Bergasma.

Following portion be deleted:—

'Recommended also that the Punjab Medical Council should consider the advisability of specifying a maximum size for a Sign-board'.

The name of Dr. Bakhtawar Singh Jain be removed from the Punjab Medical Register.

THIRD UNITED INTERNATIONAL CONGRESS OF TROPICAL MEDICINE AND MALARIA

AMSTERDAM/ROTTERDAM, 24TH SEPTEMBER TO 1ST OCTOBER, 1938

Patroness: Her Majesty the Queen of the Netherlands

THE third international congress of tropical medicine intended to meet in 1932 at Amsterdam, but it was put off because of the unfavourable times. The third international malaria congress was to take place at Madrid in 1935, but after being put off it had to be definitely given up.

The Netherlands Society of Tropical Medicine has now taken the initiative to organize a combined congress for both, in the last week of September 1938.

All who have sent in their names as entrants to the secretary's office, Instituut Voor Tropische Hygiene, Mauritskade 57, Amsterdam O and have paid the appointed fee of £1 are admitted to the congress.

Members of the congress may give the names of their families as associated members of the congress, after payment of the fee appointed for such, of 10 shillings.

Ordinary members receive the printed reports of the congress. They have the right to attend all the meetings of the congress sections, and to take part in the discussions, the various festivities, receptions and excursions.

Associate members may not take part in the discussions and do not receive the printed reports.

There is a reduction on travelling expenses and hotel prices.

TENTH INTERNATIONAL MEDICAL CONGRESS FOR PSYCHOTHERAPY

THE CONGRESS WILL BE HELD AT BALLIOL COLLEGE, OXFORD, ENGLAND, FROM FRIDAY, 29TH JULY, TO TUESDAY, 2ND AUGUST, 1938

THE International Medical Society for Psychotherapy, under whose auspices the congress is being held, has been in existence for some fifteen years. The first President was Professor Kretschmer; recently that position has been taken over by Professor Jung.

The objects of the society are:—(1) To establish, so far as possible, basic principles common to all those working in the same field. (2) To provide a platform where workers in every branch and school of psychotherapy can bring their best contributions and listen to those of leading men and women from other countries. (3) To foster international contacts within a scientific fraternity. (4) To publish original work of merit.

Previous to 1937, when the congress was in Copenhagen, meetings had taken place in various towns in Germany. This is the first occasion that the congress has taken place in an English-speaking country.

TUBERCULOSIS NEWS FOR THE MONTH OF MAY 1938

Carlo Forlanini Institute Scholarships.—The International Union against Tuberculosis, on which India is represented through the King George Thanksgiving (Anti-Tuberculosis) Fund, has informed the Central Fund Committee that the Italian Fascist National Federation has placed at the disposal of the union six scholarships at the Carlo Forlanini Institute, Rome.

These competitive scholarships, of a value of 2,000 liras each plus board and lodging, are intended to enable foreign medical practitioners to stay at the Carlo Forlanini Institute, Rome, for a period of eight months (15th November, 1938, to 15th July, 1939).

The scholarships will preferably be awarded to young physicians who are already familiar with tuberculosis problems and who wish to improve their knowledge of this branch of medicine. The kind of work undertaken at the Institute shall be subject to an agreement between the Director of the Institute and the candidates.

The Central Fund Committee has asked its provincial committees and principals of the medical colleges in India to recommend suitable names for the consideration of the Fund Committee. Names of selected candidates will be forwarded to the executive committee of the union, which will meet on 11th July, 1938.

National Association for the Prevention of Tuberculosis, London.—The 24th Annual Conference of the Association, included in which is the annual meeting of the Care Committee as already announced, will be held in the Great Hall, British Medical Association.

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Tavistock Square, London, W.C.1, on 29th and 30th June and 1st and 2nd July, 1938.

The subjects for discussion at the conference are:—

1. The development and organization of anti-tuberculosis activities in rural areas.
2. The family and tuberculosis—the discovery and protection of contacts in a tuberculous household.
3. The control of tuberculosis in tropical and sub-tropical regions.
4. The mental aspects of tuberculosis:—

(*a*) How tuberculosis affects the mental life of the normal person.

(*b*) How the mentally disturbed patient is affected by tuberculosis.

Major-General E. W. C. Bradfield, Major-General H. C. Buckley and Lieut.-Colonel C. M. Nicol have been appointed official delegates on behalf of the King George Thanksgiving (Anti-Tuberculosis) Fund.

The council are, however, most anxious to include in the conference private persons, who are interested in tuberculosis and its allied problems. Fee for membership for the conference is fixed at one guinea.

Her Excellency the Marchioness of Linlithgow's Appeal for the King-Emperor's Anti-Tuberculosis Fund.

The total collections actually received by the Honorary Treasurer on the 23rd May came to Rs. 39,99,575-9-2. Collections are going on steadily throughout the country although in some provinces appeal committees were not formed until as late as the middle of April.

In the course of a speech made in Bombay on the 10th May Mr. Subhas Chandra Bose, the President of the Indian National Congress, made an appeal to his countrymen to open wide their purses in aid of the Anti-Tuberculosis Fund.

An appeal committee has been formed in England and sums are being contributed by private individuals and by firms that have dealings with India. It is hoped also that those who are studying or on any other business in England from this country will also contribute.

INDIAN MEDICAL BIRTHDAY HONOURS, 1938

THE following are the names of medical men and others, associated with medical institutions, in the Indian Honours List of date 9th June, 1938. We offer them our congratulations:—

C.I.E.

Lieutenant-Colonel N. S. Jatar, Inspector-General of Prisons, Central Provinces and Berar.

Lieutenant-Colonel E. H. Vere Hodge, Professor of Medicine, Medical College, Calcutta, and First Physician to the College Hospital, Bengal.

O.B.E.

Lieutenant-Colonel A. N. Bose, Professor of Pathology, Prince of Wales' Medical College, Patna, Bihar.

Lieutenant-Colonel L. K. Ledger, Civil Surgeon, Peshawar, North-West Frontier Province.

M.B.E.

Captain E. Benjamin, Assistant Director of Public Health, Sind.

J. E. R. Heppolette, Clinical Assistant to the Professor of Midwifery, King Edward Medical College, Lahore, Punjab.

Lieutenant R. Holmes, Quarantine Medical Officer, Bahrain, and Medical Officer-in-Charge, Victoria Memorial Hospital, Bahrain, Persian Gulf.

T. Jadwiga, Mrs. Subramania Iyer, Director, Maternity and Child Welfare Section of the United Provinces Branch of the Indian Red Cross Society.

L. A. Marion, Mrs. Macgregor, Matron, Irwin Hospital, Amraoti, Central Provinces and Berar.

Kaisar-i-Hind Medal
(First Class)

Miss C. Tyzack, Matron, Medical College Hospital, Patna, Bihar.

Kaisar-i-Hind Medal
(Second Class)

Miss C. B. M. Adderly, Missionary Doctor, Society for the Propagation of the Gospel, St. Catherine's Hospital, Cawnpore, United Provinces.

Miss P. K. Chaudhuri, Lady Doctor, Female Outdoor Department, Howrah General Hospital, Bengal.

Miss E. Paterson, Nursing Superintendent, Dow Memorial Hospital for Women, Gujerat, Punjab.

Miss E. E. Tucker, lately Medical Superintendent, Methodist Mission Hospital, Ikkadu, Chingleput District, Madras.

H. H. Keswani, Private Medical Practitioner, Sind.

S. Noronha, Honorary Secretary, Bombay Social Hygiene Council, Bombay.

Kaisar-i-Hind Medal
(Third Class)

Miss E. France, Nursing Sister, Afghan Mission Hospital, Peshawar, North-West Frontier Province.

A. R. D. Dalvi, Inspector of Sanitation and Vaccination, Thana S. D., Thana, Bombay.

B. B. Deshpande, Inspector of Sanitation and Vaccination, Ahmednagar District, Bombay.

Sardar Bahadur

Sardar Sahib Sardar Sohan Singh, Punjab, Civil Medical Service, Amritsar, Punjab.

Khan Bahadur

Mr. Fazlur Raschid, Superintendent and Medical Officer, Edulji Framjee Allbless Leper Home, Trombay, Bombay.

Rai Bahadur

Rai Sahib Jasoda Nand Srivastab, Civil Surgeon, Ghazipur, United Provinces.

Pandit Bhuban Chandra Pant, Civil Surgeon, Budaun, United Provinces.

Rao Bahadur

Mandalam Subramania Ayyar Avargal, Honorary Surgeon (Retired), Government Hospital for Women and Children, Madras.

Rao Sahib Vidya Sankar, Chief Medical Officer, Kotah State, Rajputana.

Khan Sahib

Mr. Abdul Kahir, Medical Practitioner, Calcutta, Bengal.

Muhammad Hafizul Haqq, Civil Assistant Surgeon, Subdivisional Hospital, Barh, Patna, Bihar.

Rai Sahib

Mr. Mahadev Ganguli, Medical Practitioner, Calcutta, Bengal.

Mr. Satyendra Kumar Sarker, District Health Officer, Rangpur, Bengal.

Pandit Lakshman Prasad Misra, Honorary Medical Officer, Sardar Hospital, Etawah, United Provinces.

Mr. Lakshmi Narain Mathur, Honorary Dental Surgeon, Benares, United Provinces.

Mr. Sashi Mohan Rudra, Selection Grade Sub-Assistant Surgeon, Civil Hospital, Kalaw, Burma.

Babu Radhika Prasad Ghosh, Civil Assistant Surgeon, Patna City Hospital, Patna, Bihar.

Mr. Chhotubhai Shankarbhai, Sub-Assistant Surgeon, Ajmer-Merwara Medical Department, Ajmer-Merwara.

Jemadar Lala Ruplal Kohli, in Sub-Charge, Cantonment Hospital, Mhow, Central India.

Mr. Issac Santra, Propaganda Officer, British Empire Leprosy Relief Association (Indian Council), New Delhi.

Rao Sahib

Mr. Walajapet Vijiaraghavan Perumal Avargal, District Health Officer, Madras.

Mr. Kashinath Vishnu Chipkar, Civil Surgeon (Officiating), East Khandesh, Jalgaon, Bombay.

Mr. Mysore Gaikawad Ramachandra Rao Avargal, Chief Medical and Sanitary Officer, Pudukkottai State, Madras States.

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Current Topics

Difficulties in the Use of Protamine Zinc Insulin

By ELLIOTT P. JOSLIN, M.D.

(From the *Journal of the American Medical Association*, Vol. CX, 1938, p. 90.)

THE advantages of protamine zinc insulin are so marked that one is loath to lay undue emphasis on difficulties in its use which have been great enough to lead a few patients to return to regular insulin. I have encountered thirty-eight of these and will now briefly describe them, because in general such a return was unnecessary. This is plainly evident because already eight of the thirty-eight have resumed protamine zinc insulin. The temporary omission of protamine zinc insulin was due in five cases to lack of knowledge of its use on the part of the patient, which resulted in reactions and in one case to lack of confidence in it because the preliminary period of instruction had been too short. Another patient gave it up because of a projective trip, quite rightly believing that on a journey long acquaintance with regular insulin would make its employment safer than protamine zinc insulin, with which she had slight experience. The final patient of this group had simply been given protamine zinc insulin in a series of test experiments for which he deliberately came into the hospital.

Experience in the treatment of patients with protamine insulin or, as now employed, protamine zinc insulin certainly does help in transferring patients on regular insulin to protamine zinc insulin. Thus before 1st October, 1936, 64 per cent of our patients taking protamine insulin alone or combined with calcium or zinc could be classified as showing either excellent or good results, whereas since 1st October, the percentage has risen to 73. Confidence in the use of protamine zinc insulin on the part of the physician also is an important factor. Now we know from the statistical summaries made that our patients taking protamine zinc insulin or even combined regular and protamine zinc insulin do better than those on the former plan of treatment.

There is no gainsaying the fact that eight patients of the remaining thirty returned to regular insulin because they were convinced that the protamine insulin did not control the diabetes. Such a condition could have been avoided in two instances if the physician had not raised the carbohydrate in the diet during the transfer. These patients had been on a fairly low carbohydrate diet, and so seldom do we use so low carbohydrate values to-day that thoughtlessly we increased the same too much or too rapidly. The duration of the diabetes in one of these cases was eighteen years, and the other began in childhood and already was over twelve years. Three other persons who were living very useful and active lives and had survived diabetes by fifteen years did not get as good control of the disease with protamine zinc insulin as with regular insulin, even though they tried both protamine and protamine zinc insulin. They had been accustomed to regular insulin in two or three doses and in this manner could live so efficiently and with such freedom from glycosuria or reactions that they felt happier returning to the regular insulin even with its multiple doses. It is my personal belief that if these three patients cared to take the time to learn how to use regular and protamine zinc insulin together, because they undoubtedly would require combined doses, their diabetes would be far better controlled and they could live quite as efficiently. It is true that to do so it would be necessary that the old idea of changing the dosage of insulin from day to day would be replaced with the increase or decrease of diet to attain results. Two of these patients did not feel as well generally, and although they were not showing reactions I suspect that the fact that their blood sugar tests were on a much lower level than on which they had lived for years may have been a factor in this disability. Such patients should be changed to protamine zinc insulin very gradually. Furthermore, physicians and patients too should realize that protamine zinc insulin acts for such a long period that there is no use in altering doses daily, but one should be guided by the result of tests over a period of days.

It is true that with protamine zinc insulin occasionally one has a day of unexplained heavy glycosuria even though apparently conditions are identical. I myself do not believe that the conditions have been identical in such cases but rather that without recognition on the part of the patient more food may have been taken quite honestly; in the second place, less exercise in one form or another or more exercise may have been introduced. Then the insulin may not have been injected in quite the same manner. I grant that such days were not as commonly encountered with regular insulin, but there is no use denying the fact that protamine insulin may not be as uniformly absorbed as the regular insulin. I do not think that this irregularity often occurs, and I have less inclination to think so, because with U-80 protamine zinc insulin the results are quite equivalent to a dose obtained with U-40 insulin and such an action one would not expect if the protamine zinc insulin was absorbed very irregularly.

Habit plays a great factor and involuntarily an intelligent patient learns how to live after fifteen years of experience with diabetes. For one who suddenly takes up new methods, life cannot be expected to run as smooth a course.

Of this group of eight, one was notable because severe neurologic symptoms occurred following reaction with protamine zinc insulin. Whether these had any connection with the actual reactions I am in doubt, because this patient had had reactions before with regular insulin and they might have been related to these. Furthermore, it is very questionable, in my mind, whether the neurologic symptoms were not from some other cause. One neurologist interpreted them as multiple sclerosis and another considered that they were part of an organic lesion in the brain. At first we supposed that they were simply manifestations of neuritis so frequent in diabetes and that they had no connection with the reaction. When I last saw the patient a cerebral accident appealed to me most as the ætiologic factor for the symptoms, and it is true that in a young man without other cause suspicion falls on the type of insulin which chanced to have been used. No similar instance has been encountered in the 1,250 and more patients taking protamine zinc insulin.

Consideration of the three patients who in the past habitually took liberties with their diet and adjusted their insulin for this purpose calls for a more careful discussion. They found it more difficult to follow such practices with protamine zinc insulin than with regular insulin, although I think they could have done so provided they had added a little regular insulin as a second dose later in the day. Thus Wilder with patients in coma and I with surgical patients and with patients with infectious diseases have used protamine zinc insulin as a basic treatment, and in addition regular insulin has supplemented it depending on the condition of the urine collected at intervals of from four to six hours. Before protamine zinc insulin came in we were accustomed to recommend the fraction according to the result of Benedict's test

red	orange	yellow	green	blue
20	15	10	5	0

units at the respective intervals of four, six or eight hours. With the use of protamine zinc insulin the figures would drop approximately one half.

The five patients who gave up protamine zinc insulin permanently because of reactions were led to do this largely because of reactions developing during exercise. There is no doubt that with protamine zinc insulin

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carbohydrate is better utilized and there is less available for use during muscular exertion unless the supply is increased. The patients who are trained first with protamine zinc insulin learn this readily, but other patients who have been habituated to regular insulin have great difficulty in acquiring this knowledge and utilizing it as a routine technique during exercise. Diabetic patients to-day follow such active lives that I believe that, if there is any tendency in any given patient to a reaction, the patient must be brought up to take carbohydrate between meals and on retiring. It simply will not do for the diabetic patient to develop the reputation that he is liable to become unconscious or to have convulsions at any odd moments.

The type of reaction that the protamine zinc insulin patient endures is distinctly uncomfortable. The headache lasts a long time and is not promptly relieved with carbohydrate. The nausea may be very annoying. There are other reasons than protamine zinc insulin, however, for headache and for nausea and these must be sought before laying the blame on protamine zinc insulin. Nevertheless, it is a fact that the headache is depleting and that the nausea is dangerous because it confuses the diagnosis with appendicitis and diabetic coma.

The occupations of three patients were of so varied and changing types that to-day I would hesitate to recommend protamine zinc insulin as the chief basis for their treatment. These were well-trained diabetic patients; they had had their disease for years, had worked and laboured to secure these special occupations and to their precious jobs they had adjusted their entire lives; years of trial and error had been devoted to this object, and a week or two or even a month or two of trial with protamine zinc insulin could not equal what they had accomplished with years of use of regular insulin.

The remaining ten cases of the series in which protamine zinc insulin was given up can be placed in a miscellaneous group. Again here one encounters two instances in which the intelligence of the patient was not equal to the use of the combined regular and protamine zinc insulin, although with a milder type of diabetes the patients could have been brought up to live on protamine zinc insulin alone. There was another patient, a problem child, and still another with encephalitis and one with unusual œdema of doubtful origin. The three patients had been confused because in the early days of protamine insulin we had been obliged to transfer from one preparation to another as new varieties appeared, and in two others we simply did not insist on a long enough period of treatment before discharging the patient.

A hospital stay is not always necessary for a diabetic patient who is to use protamine zinc insulin, but I do think that a hospital stay is very essential if one is to attempt to change a patient who has lived for years successfully on regular insulin over to the combined regular plus protamine zinc insulin. These patients simply must see others going through the process so as to learn the mistakes that can occur. They think they know all about the management of their diabetes, and it is only by having them under observation, where they can watch others as well as themselves, that one can secure the best results. When I see Mrs. St. C., who for months was compelled to take nearly 500 units of regular insulin daily, now living comfortably on regular insulin 100 units and protamine zinc insulin 300 units, each given before breakfast, it makes me confident that any case needing far smaller quantities of insulin could be adjusted satisfactorily. The patient in question has gained from 87 pounds (39.5 kg.) up to 111 pounds (50 kg.). The cause of her insulin resistance need not be discussed here, because eventually a more extensive report will be made; but her case is cited as showing what one can do with protamine zinc insulin and as a hint that other cases far less severe, when the conditions are right, can be managed as well. The number of cases of considerable severity managed satisfactorily on combined regular and protamine zinc insulin almost daily reconvinces me how satisfactorily protamine zinc insulin can act. Furthermore, the fact that not one patient who has started his treatment with protamine zinc insulin has been changed to regular insulin in the course of twenty-two months is another argument for the efficiency of protamine zinc insulin. Patience, time and the will on the part of both patient and physician to secure the full benefit which protamine zinc insulin can confer, in my opinion, will surmount any temporary difficulties.

Nutrition and Diet in Northern India : A Comparative Dietary Survey

By DAGMAR CURJEL WILSON, M.D. (Glas.), M.R.C.P. (Lond.), M.C.O.G., D.P.H.
Women's Medical Service, India (Retd.)
and
E. M. WIDDOWSON, PH.D.

(From the *Lancet*, Vol. II, 18th December, 1937, p. 1445)

THE survey is of the diet of 120 families, Hindu, Indian, and Sikh, and it records the nutritional state of 6,000 children belonging to these wheat-eating races. The purpose of the investigation was to correlate diet and stature, and to ascertain whether differences occur in the incidence of disease among the different races, and whether diet influences susceptibility to certain infectious diseases. The method chosen was to study the food as eaten in a sampling of the homes, and to make measurements and observations on the children deriving from such homes. The communities studied are of rather special interest because they include the Sikh community with whose diet McCarrison made his well-known demonstration with rats (1926–27, 1932). When fed from youth throughout the growing period on a reproduction of the Sikh diet these young rats grew far better and were far freer from disease than their fellows, reared on a reproduction of a poor Western European diet or of inferior Indian diets, particularly those of rice-eating peoples.

Hindus, Muslims, and Sikhs living in Northern India are acclimatized to both heat and cold. Many are virile folk known to be physically strong, among whom, when not otherwise occupied, family feuds are not uncommon; from amongst these races many military recruits are obtained. Girls in Northern India are well cared for, and the age of marriage is usually higher than in other parts of the country. The staple crop in the north is wheat which is eaten by all, usually in the form of whole wheat flour, coarsely ground and baked, of which McCay has shown 80 per cent of the protein to be absorbed. There are certain racial differences in the diet. *Hindus*, except among the lower castes, do not usually include flesh in their dietary. They use a variety of pulses and vegetables and fruits, and as much cow's milk and clarified butter as they can afford. *Muslims* eat meat, but usually not in any large amount. They tend to cook their vegetables together with meat, and to use more rice and less milk and clarified butter than Hindus. *Sikhs*, where economically possible, combine the best of Hindu and Muslim diets, and are partial to the use of buffalo milk with its high fat content in preference to cow's milk.

DIETARY SURVEY

The dietary survey was supervised personally by the author speaking the vernacular. A period of ten consecutive days in the winter season was chosen for observation. In Northern India, except for any untoward incident such as the failure of crops, the amount and character of the diet is fairly constant throughout the year, save that during the hot season diluted buttermilk is generally drunk.

Records were obtained from 120 families containing 730 persons; this total was made up of equal numbers of Hindu, Muslim, and Sikh families, of which half in each case were urban and half rural, in the relatively

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prosperous district of Sialkot in the Punjab. Families were chosen of different economic and social status, to represent the different types of homes from which school-children were drawn. The homes were visited twice daily before the cooking of the principal meals, and the foodstuffs were weighed on a portable balance. In an Indian household there is little waste; it is customary to cook the amount of food that will be used. Allowance was made for guests, and for food given in charity and to animals. As far as possible only the actual parts of food to be cooked were weighed. To handle food after cooking was not allowed, and estimates regarding the effects of cooking are not available.

The social and economic status of the family and its consequent purchasing power were checked by inquiries as to sources of income, but calculations as to net income were not reliable, and the profession of the principal breadwinner was judged to be a more satisfactory indication of family status. From such data and from personal inquiries in bazaars, and from the study of the accounts of boarding-schools and institutions, it is concluded that for an expenditure of 4 annas (about 4*d*.) per head daily on foodstuffs an adequate, balanced diet can be easily obtained. The age and sex composition of each family were recorded, with the total intake of the various food constituents. The analysis of foodstuffs was carried out at the Nutritional Research Laboratory, Coonoor.

Nutritional state of the children

Examinations of the nutritional state of 6,000 children, Hindu, Muslim, and Sikh, in approximately equal numbers, were carried out in the winter season by the same observer. All the children were between the ages of 5 and 14 years. The children were living at their homes, where the investigation was made, and consuming the racial diets, indicated in the previous section. Proportionate numbers were examined from the different social classes served by primary, middle, and high schools. About one-quarter were at rural schools, and more than half the total number were girls.

Incidence of disease in relation to nutrition

Inquiries were made about the clinical incidence of disease, hospital records being supplemented by personal inquiries from medical practitioners, and by visits to hospitals. Not many generalizations emerged suitable for inclusion within the scope of this summary. The large number of children who suffered from greatly enlarged tonsils in all classes of schools housed in insanitary quarters within ancient walled cities was noteworthy. Of girls between 4 and 14 years of age, 1,348 were examined in urban areas, and 771, more than half, showed diseased tonsils. In rural areas the figures were somewhat less bad; of 731 examined about one-quarter (176) had this defect.

The relation of diet to malaria was studied in villages round Delhi where the investigation of the Malarial Survey of India has shown malaria to be endemic and a very high rate of infection to exist. Very many children showed signs of anæmia and debility, and few had access to quinine.

Deficiency diseases and conditions associated with dietary factors

Signs of deficiency disease were remarkably infrequent; 3,985 children between 5 and 14 years old were examined from this point of view, and, of these, 107 showed follicular hyperkeratosis (phrynoderma), 24 had angular stomatitis, none buccal stomatitis, 6 had Bitôt's spots, and 43 had rickets. There was thus some slight evidence of vitamin-A deficiency but it did not appear to be widespread.

Conditions frequently met with in certain other parts of India are uncommon among these northern races. Leprosy occurs in the submontane regions of the north, the infection being carried down the passes by wandering tribes from the Central Asian highlands, but leprosy is rare in the plains of Northern India. Spastic paraplegia is rare and peptic ulcer relatively uncommon. In pregnancy the numbers of cases of anæmia and of eclampsia are small compared with those seen in women's hospitals in other parts of India, and peripheral neuritis associated with pregnancy is very rare. Statistics about maternal mortality in India are often misleading, but such information as is available suggests a lower mortality in the north. The occurrence of late rickets and osteomalacia, often an important contributory cause of high maternal mortality, among certain other northern peoples living under conditions of deficiency of food or sunlight or both, has already been described.

On the other hand, vesical calculus occurs frequently and has a definite 'social incidence', being commoner among the poorer classes. Its association with the wheat diet and hot summers of Northern India has been noted by McCarrison and others.

Hæmoglobin estimations

Records were obtained of 166 children from more educated families who volunteered to be 'pricked'; these were boys and girls between the ages of 5 and 15 years attending three large northern public schools. The average percentage hæmoglobin was 83.7 ± 0.5 (S.D. ± 6.3) with a Dare hæmoglobinometer standardized so that 100 per cent equals 16 g. hæmoglobin. Many children stated that they had attacks of fever in the autumn, and this was confirmed by the guardians, but all were in a position to cut short an attack of malaria with quinine.

Summary and conclusions

The dietary intake of 120 families containing 730 persons of the wheat-eating communities, Hindu, Muslim, and Sikh, in a relatively prosperous region of Northern India was recorded, and the nutritional adequacy of the diets was assessed by a physical examination of 6,000 children consuming them. The dietary records are analyzed by Dr. E. M. Widdowson, who reports that the intake of calories, proximate principles, calcium, phosphorus, and iron are adequate when calculations are based on the international scale of consumption units, but that when the Stiebling scale is applied the calcium appears to be slightly deficient in all the diets. The results of the physical survey of the children are analyzed statistically by Mr. Carl Wait, who reports that the amount of subnormality is slight, about one-fourteenth of the children on the Sikh diet, about one-sixth on the Hindu, and about one-fourth on the Muslim being assessed as somewhat subnormal. Only one child in the whole series was actually classed as 'bad'.

It can therefore be concluded that the diets studied and the physical condition of those consuming them are by no means unsatisfactory, and that McCarrison's experimental demonstration with rats of the excellence of the Sikh's wheat-containing diet is fully borne out.

The table shows the average intakes of calories, proximate principles, calcium, phosphorus, and iron, per consumption unit per day, for the six different groups studied. It is apparent from this table that in many respects the average results for the various groups are similar to one another, so that certain generalizations may be made.

The calories lie between 2,300 and 2,900, lower than the figure 3,000 suggested as desirable by most authorities but probably not inadequate. The protein intake, 70 to 90 g. a day, compares well with the commonly accepted figure of 70 to 100 g. for a man's protein requirement. The intake of animal protein, on the other hand, is always very low when judged by European and American standards, all but one group having less than 20 g. a day. Little or no meat is eaten, and almost all the protein is derived from cereals. Milk and milk products provide the small supply of animal protein. The fat consumption is also low in comparison with this country, but no optimum or minimum requirement for fat has been suggested, so there is no evidence that the intake is inadequate. The fat is derived mainly from milk products. The amount of carbohydrate is high, because of the large quantity of cereals eaten.

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TABLE

AVERAGE INTAKE OF CALORIES, PROTEIN, FAT, CARBOHYDRATE, CALCIUM, PHOSPHORUS, AND IRON per consumption unit (international values) per day

Group	Total number of persons	Total number of consumption units	Calories	Animal protein (g.)	Protein (g.)	Fat (g.)	Carbohydrate (g.)	Calcium (mg.)	Phosphorus (mg.)	Iron (mg.)
Hindu urban ..	94	72.9	2,319	9.9	69.8	49.2	382.9	773	1,654	30.4
Hindu rural ..	121	92.0	2,720	8.5	81.4	53.1	459.7	813	2,047	39.2
Muslim urban ..	121	84.8	2,485	26.8	84.2	57.0	397.9	826	1,874	31.6
Muslim rural ..	158	110.0	2,506	9.4	75.3	39.2	445.8	609	1,854	34.7
Sikh urban ..	116	86.4	2,776	16.0	87.9	59.2	454.7	1,005	2,118	36.3
Sikh rural ..	125	94.7	2,908	13.0	89.4	58.6	487.5	987	2,207	40.2

In summer especially, diluted buttermilk in varying amount may be drunk and this has not been included in the records. Amounts of 3 oz. or less of undiluted buttermilk will make no appreciable difference to the protein, fat, carbohydrate, or iron, but the calcium and phosphorus may be increased by 25 mg. a day.

In considering mineral intakes, it is usual in investigations of this sort to take the figures suggested by Sherman, 0.68 g. of calcium, 1.32 g. of phosphorus, and 12 to 15 mg. of iron a day, as standards for adult requirements of these elements, and to compare the findings with them. Actually, Sherman's values were never intended to be used as absolute standards, but only as a rough guide to requirements. Since, however, no other standards for mineral requirements are in existence, Sherman's figures have been adopted, but with full realization of their limitations.

When calculated on the international consumption unit basis, the average intakes of calcium, phosphorus, and iron may be considered adequate in all groups, and the iron intake is remarkably high. This iron is obtained mainly from whole wheat.

A comparison of the results for Hindus, Muslims, and Sikhs shows that, although there are no great differences, and Sikhs have the best diet throughout, their consumption of every constituent is higher than that of either of the other two groups. There is little to choose between the results for the Hindus and the Muslims. A further point of interest is the difference between the diets of urban and rural communities. The rural diets are in all cases higher in calories than the corresponding urban diets, owing to a greater consumption of cereals and hence of carbohydrate in the country. The town-dwellers, on the other hand, tend to have more animal protein, and this is especially noticeable in the case of the Muslims who eat a small quantity of meat.

The results shown in table are average results for 20 families in each group. There is considerable variation from family to family in the intake of all constituents. With calories, for example, there are one or more families in each group having more than 4,000 calories per consumption unit per day, and there are usually several having only 1,000 to 1,500. A number of families have no animal protein at all, while one Muslim urban family had 146 g. per consumption unit per day.

Oxygen Want and Oxygen Therapy

(From the *British Medical Journal*, Vol. I, 29th January, 1938, p. 235)

ALTHOUGH a great deal of information was to hand, from the Haldane and Bancroft schools of research, regarding the effects of oxygen want on respiration and blood gases respectively, what was actually happening in the cells and tissues was not so clear. This required more direct study of gas pressures in the tissues themselves. Normally in the resting subject the oxygen pressure in the extracellular fluids—for example, serous fluid, lymph, urine—and probably in the cells themselves, is certainly not zero, but varies for different regions between 20 and 40 mm. Hg. or 3 to 6 per cent atmosphere, while the carbon dioxide pressures are about 40 to 60 mm. Hg. or 6 to 8 per cent. As might be expected, these figures, which apply to man and all laboratory mammals tested, resemble the pressures usually given for gases in venous blood. Effects of oxygen want and oxygen therapy upon tissue gas pressures may be easily tested with experimental animals. Thus acute oxygen want, apart from the histotoxic variety—for example, poisoning with cyanide, which affects the ferment system—always lowers the oxygen pressures in the tissues considerably, and if the fall is much below 40 per cent of the normal death results. Life is not possible with a tissue oxygen pressure in general anywhere near zero. Locally a zero oxygen pressure is approached only where there is pus, necrosis, and stasis of circulation—for example, in pyopneumothorax or in the large intestine with food present and fermentation proceeding.

As regards acclimatization to the more severe degrees of oxygen want, the oxygen pressure in the tissues is not raised to normal again even when there is increase both in volume breathed and in red cell count. Such increases seem to be used not to raise the tissue oxygen pressure to normal again but to relieve the work of the heart that is to limit the minute output. Acclimatization is due to the vital organs becoming accustomed to function under the lowered tissue oxygen pressure. Possibly there are changes in the cells concerning such substances as the glutathione of Sir Frederick Gowland Hopkins and the reactions described by Professors Warburg and Keilin. Oxygen secretion, if it does occur in the lungs, is—like any other factor in the body—not capable of keeping the oxygen pressure in the tissues at a normal level during severe degrees of oxygen want. Another important result is that administration of oxygen—even in only double the normal (21) percentage—definitely raises the oxygen pressure in the tissues in a normal animal. This affords the scientific basis for oxygen therapy.

Concerning the powers of endurance, it is found that mammals cannot live continuously in regions where there is only 10 per cent or less of oxygen in the atmosphere; this is equivalent to an altitude of about 20,000 feet. Such degrees of oxygen want cause atrophy, degeneration, and even necrosis in the liver.

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heart, brain, and other organs. This limit of 10 per cent was first established with laboratory mammals, and has recently been confirmed for a highly selected community in the South American Andes, as recorded by Dr. Ross McFarland. Some sulphur miners there work at a slow pace at 19,000 feet, but find that they cannot continue in health if they sleep and live continuously above 17,500 feet. Their camp at 17,500 feet is claimed to be the highest permanent village in existence. The miners descend to 12,000 feet for a proper game of football and also send their wives to this level for confinement, though fertility appears to be maintained at 17,500 feet, where the arterial blood saturation with oxygen is about three-quarters of normal. It is obvious that the Everest climbers should not spend too long camping above 18,000 feet. Some of these climbers, like the experimental animals, have exhibited some *temporary* resistance, but, since at 27,000 to 28,000 feet the climbers are reported to have suffered from delusions and to require ten breaths for each step forward, oxygen should be at hand to prevent further calamity in these very high regions.

That mammals cannot live continuously in an atmosphere containing only 10 per cent of oxygen leads to interesting conjectures. Some authorities hold that at one early period of the earth's existence there was not free oxygen in its atmosphere and life was anærobic; the oxygen now present was freed, under the influence of the sun, by that green plant life which laid down enormous deposits of coal. Dr. W. M. Clark, who has carried out important researches on oxidation-reduction potential, considers that oxygen is a scavenger clearing up the waste products of cell metabolism by combustion. From the above it might be tentatively suggested that when mammals were first sprouting from the tree of life the oxygen present in the surrounding atmosphere had risen above 10 per cent, and that is why mammals cannot now become acclimatized to lower oxygen pressures. When the condition of a patient with oxygen want resembles that of an individual forced to breathe less than 10 per cent of oxygen continuously recovery is impossible.

Turning to modern oxygen therapy, the late J. S. Haldane and others—including Professor Dautrebande—have much improved the mask method employed by Beddoes (1760 to 1808) at Bristol; he and Chaussier (1780) appear to be among the first to administer oxygen to patients. Some of the present forms of mask apparatus are too heavy for weak patients but are inexpensive to run and of service for the stronger patients. Sir Leonard Hill introduced the recent chamber and tent methods, but the first comfortable chamber was that of Sir Joseph Barcroft at Cambridge, while tents have been much improved by Dr. A. L. Barach and others. The chamber, or room, methods are the most comfortable, but running expenses are high. Even the simplest tents—for example, the Guy's Hospital tent and the open-top tent of St. George's Hospital—though cheaper than oxygen chambers, cost up to about thirty to forty shillings a day to run, and often demand constant skilled attention. Still cheaper and simpler methods for nurses are the twin catheter method, the forked nasal tube, and the box mask or face tent; the nasal methods cannot be used with blocked nasal passages. Tents seem valuable for children and for the more restless patients.

Oxygen therapy should of course be used in all cases of excessive dyspnœa and asphyxia as emergency treatment. Also in diseases with cardio-respiratory embarrassment it may certainly keep a patient alive and enable other therapy—for example, serum in pneumonia—and natural processes to produce a favourable result. Pneumonia, the disease most frequently treated with the aid of oxygen, is responsible for about 500,000 patients, with 100,000 deaths, a year in the United States, where much research is being directed towards reducing this incidence and mortality. With less than half the population of the United States, England and Wales (1936) had 46,000 cases, with over 30,000 deaths. The value of early treatment with oxygen—within the first six hours of onset—in lessening serious complications seems to have been proved in America. Pure oxygen should be used for short periods only—a few hours—the limit recommended for prolonged treatment being 60 per cent, since with higher percentages the late Lorrain Smith found evidence of damage to lung tissue.

Professor Yandell Henderson's advocacy of carbon dioxide as a respiratory stimulant is justified; for carbon monoxide poisoning 7 per cent carbon dioxide with 93 per cent oxygen gives the best results, according to a prolonged test in the New York emergency service. In anæsthesia and asphyxia neonatorum 5 per cent carbon dioxide with 95 per cent oxygen is useful. Dame Louise McIlroy's apparatus is simple and efficient with the newborn. Artificial respiration is often used in conjunction with oxygen therapy; the Sharpey-Schafer method is still the simplest and most efficient for general purposes, and there is also the recent rocking method of Dr. Eve. The Bragg-Paul pulsator for rhythmical compression of the chest is simple and useful for prolonged periods; it kept a patient with progressive muscular atrophy alive for some years. The Drinker apparatus, although complicated, is perhaps the most physiological, and has been much used in respiratory paralysis. Some recent and fairly full data seem to show that with this Drinker treatment only about 10 per cent of the cases with bulbar respiratory paralysis *eventually* recovered, as did about 30 per cent of cases with spinal respiratory paralysis; nevertheless the *immediate* and dramatic value of the apparatus is obvious.

Permissible Claims for Benzedrine Sulphate

(From the *Pharmaceutical Journal*, Vol. CXL, 8th January, 1938, p. 28)

AFTER consideration of the available evidence, the Council on Pharmacy and Chemistry of the American Medical Association has agreed to accept benzedrine sulphate for inclusion in 'New and Non-Official Remedies' providing that the claims for the usefulness of the drug do not exceed the following stipulations:—

Narcolepsy.—Benzedrine sulphate is useful for the treatment of narcolepsy and for controlling symptoms similar to those of narcolepsy in the treatment of post-encephalitic Parkinsonism. Its use is not recommended in the treatment of sleepiness and fatigue in normal individuals, because of the possible danger of pressor effects from continued use, the dangers of eliminating the warning signal of sleepiness in individuals who are over-working, because of the possibility of habit formation or addiction from such use and because cases of collapse have ensued when the drug has been used for this purpose.

Mental effects: mood and fatigue.—Benzedrine sulphate is useful in the treatment of certain depressive psychopathic conditions. Its use is not recommended for developing a sense of increased energy or capacity for work, or a feeling of exhilaration or as a 'pick-me-up' in individuals other than those under the strict supervision of the physician. The Council believes that its use for these purposes should be confined to institutions, since the dangers involved in the use of the drug for this purpose in those going about their daily tasks are similar to the dangers mentioned in connection with fighting off sleep.

Gastro-intestinal effects.—Benzedrine sulphate is useful in facilitating roentgenographic study of the gastro-intestinal tract, but it is not recommended at present for use in the treatment of spastic colitis and pylorus spasm. Further evidence is necessary before serious consideration can be given to other clinical applications.

Reactions and contra-indications.—The very nature of the therapeutic effects as well as side actions of this drug require that its use be promoted with proper cautionary statements as to pressor effect, hyper-excitability, gastro-intestinal disturbance, restlessness and sleeplessness and in overdosage, chills, collapse and syncope. It should also be carefully noted that the

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drug is contra-indicated in those having cardiovascular disease, especially when hypertension is a sequence of that disease.

Dosage.—The use of the drug should be instituted with a dose of 2.5 to 10 mgm., and it is recommended that no single dose exceed 20 mgm. In certain conditions it may be necessary to repeat the use of the drug two or three times daily. It is preferable, if possible, to administer the effective quantity during the morning.

The Significance and Treatment of Indigestion

By ERNEST BULMAR, M.D., F.R.C.P.

(Abstracted from the *Practitioner*, Vol. CXL, February 1938, p. 135)

THE meaning of some words differs according to the user, and indigestion is one of these; even to the medical man the word has no fixed meaning. He would probably intend to convey that abnormal sensations were felt in the abdomen during the course of digestion, that is before, during and after meals—he would expect any pain or discomfort to be above the umbilicus, and he would not include sensations arising during phases other than peptic digestion; he would not admit conditions associated with swallowing or with defæcation, and it is certain that he would not dub as indigestion pain arising from gallstone colic, acute pancreatitis, or even coronary thrombosis. Whether or not he would call the pain of peptic ulcer indigestion I do not know: his attitude would be to evade the issue and call the condition a gastric or duodenal ulcer.

I have not been able to fathom the layman's conception of indigestion, and it is obvious that he has many meanings when he uses the term. How many times have physicians thought they had discovered a history of duodenal ulcer in the applicant for life assurance when he admitted having had indigestion? A little deeper inquiry, however, showed that it was merely an occasional headache, or spots in front of the eyes, or undue fatigue at night, or lack of concentration which he had interpreted as due to some difficulty in digesting his food, although there had been a complete absence of the abdominal symptoms of such a disturbance of function. In hospital work the term is equally indefinite, and seems to mean flatulence in most of the patients.

There is something much more sinister in the implications of the complaint of acute indigestion; it is usually made when the patient suspects that the severity of a pain is much more than can be simply accounted for, one feels that he is using a euphemism to deceive his relatives but probably not himself, and certainly not his doctor. I have learnt to respect the unexpressed fear but to search for some grave explanation in the three cases of severe upper abdominal or substernal pain seen by the physician—gallbladder, cardiac, and pancreatic pain.

It would seem elementary to caution the unwary never to accept the patient's complaint of indigestion, but to press him to explain exactly what he means. Whether the term should be retained in medical parlance is doubtful—gastric discomfort is much better described as dyspepsia, which does at least indicate what phase of the digestive process is disordered; nevertheless it might be profitable to explore what is actually meant by the term. My own vague conception is that indigestion comprises that medley of conditions characterized by abnormal sensations in the upper part of the abdomen, but in which investigation fails to show evidence of such obvious causes as gastric or duodenal ulcer or gastric cancer; I envisage a chronic and not an acute condition, and one which produces long continued discomfort rather than a risk to life.

INCIDENCE OF INDIGESTION

During the period from 1st January, 1930, to 15th October, 1937, I have seen personally 9,580 new outpatients and 2,262 of these had disturbances of the digestive system, a percentage of nearly 25.

If my definition of indigestion is applied to a series of 2,170 outpatients the following list can be made:—

	Number of patients
Aerophagy	103
Gastric neuroses	20
Dyspepsia of uncertain origin	288
Gastroptosis	24
Chronic gastritis	111
Upper abdominal colic	33
Spastic colon	102
Visceroptosis	75
Chronic cholecystitis	100
TOTAL	856

I am doubtful about the admissibility of chronic cholecystitis, but I have left it in as it is so important a cause of difficult dyspepsias.

I propose to deal briefly with the diagnosis and treatment of each of these groups, and for this purpose I have chosen to go through both my hospital and my private case notes rather than to give merely a 'textbook' description—many of the conditions are so elusive in their clinical features that even the diagnoses I have given are made with some misgivings.

AEROPHAGY

This troublesome condition may seem too trivial to write about, but it accounts for 10 per cent of disorders of the alimentary tract if the mouth, pharynx and gullet are excluded; it has been in my experience a condition which usually goes unsuspected by the patient's medical attendant; it gives rise to symptoms which are as troublesome as those of serious organic diseases of the alimentary tract, and rarely it can cause an acutely painful abdominal distension suggesting a volvulus. Aerophagy is merely a bad habit, but it cannot be too strongly insisted that the habit is sometimes learned in an attempt to relieve by gastric distension the pain of a duodenal ulcer. In every case such a pathological condition must be excluded; this is not difficult as hospital patients must have their desire for an *x*-ray satisfied, and private patients usually arrive with a sheaf of films. There are two mechanisms by which air is allowed to enter the stomach in uncomfortable quantities; it may be swallowed unconsciously (in some patients there is an audible pharyngeal tic) and when there is a feeling of uncomfortable distension the victim tries to belch, in doing so he swallows more air and this can be proved by laying the hand on the epigastrium and feeling air gurgle into the stomach. Much of the air passes into the bowel and adds colicky pains to gastric discomfort. The second mechanism is rare—the patient closes the glottis and then suddenly depresses the diaphragm so that air rushes into the stomach as the sole channel available.

The symptoms of the condition vary considerably—they can best be illustrated by quoting a case history:—

Female, aged 39 years.—This patient consulted me on 19th August, 1931, and said that for five months she had had severe 'indigestion', although there had been previous attacks of a similar nature. On questioning she told me that her symptoms were those of epigastric distension after food especially, but occurring at other times. Occasionally there was slight pain, but never in relation to meals. She brought a set of skiagraphs of the alimentary tract and a report that the sole abnormality was a low and rather atonic stomach. Her general health had suffered and she felt a considerable loss of energy. Examination was negative except that she was of the ptotic type and her right kidney was palpable; her behaviour on being asked to 'bring up some wind' was typical of aerophagia. My notes end with the two remarks 'sensible woman', 'aerophagia'. I explained the condition to her, and I heard from a relative four

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months later that she cured herself in a few days and lost her symptoms.

Diagnosis is simple; aerophagy is suspected if the patient complains of 'flatulence' and questioning reveals that there is considerable and prolonged belching of an odourless gas; before a diagnosis is made, however, it is necessary to see the patient swallow air, and he is asked to bring up some wind; the true aerophagic will at once oblige, and continue until stopped—some indeed have been heard performing before a crowd of envious and sympathetic out-patients, but when the habit has become such an admired accomplishment it is usually incurable.

Treatment is simple but as it depends upon the co-operation of the patient it is necessary to explain to him that so large a quantity of gas cannot be formed within the stomach, and if it were formed there it would only be the result of fermentation and then it would be offensive and inflammable; when the patient has grasped this principle he is asked to lay his hand on his epigastrium during an attempt at belching and to note the gurgle. He is told that he is making matters worse by his active efforts, and forbidden to belch again, except the allowable post-prandial eructation. The next step is to ask him to watch most carefully that he is not unconsciously swallowing air, and after a few days he will realize what he has been doing and stop it. All this requires intelligence, and without intelligent co-operation the treatment of the case is impossible. There are occasionally physical conditions leading to aerography, such as ill-fitting dentures or post-nasal catarrh, and these need appropriate treatment; after the healing of a duodenal ulcer aerophagy may persist but can be put right by explanation; after an operation the condition again is not infrequent, but most good ward sisters are fully alive to its existence and take steps to eradicate the habit before the patient's discharge. I have had no experience of the various carminatives and mechanical devices for the relief of air swallowing, but I adopt the attitude that if the patient has not the intelligence to understand what he is doing he must retain his uncomfortable accomplishment.

GASTRIC NEUROSES

Among 1,576 patients with gastric symptoms, 327 had conditions without an obvious physical basis—gastric neuroses 20, anorexia nervosa 14, dyspepsias of uncertain origin 288, vomiting of uncertain origin 5; this gives a percentage of about 20, and whilst this figure cannot be more than approximately accurate I feel that it errs on the low side—the physician finds a physical explanation if he can do so. The criteria for making a diagnosis of gastric neurosis are arguable—the history may be typical in some cases, there must be a rigorous exclusion of organic disease by a complete physical examination, radiological and biochemical studies, and for the exclusion of gastritis gastroscopy is now becoming a practicable step. Whilst organic disease must not be missed the psychological explanation of symptoms must not be overlooked in order that the correct treatment may be adopted; the neuroses must be diagnosed with trepidation—I have had the painful experience of seeing a cerebral tumour develop in a man in whom I had made a diagnosis of hysterical vomiting. The psychologist is of little help in establishing a diagnosis; all that he is justified in saying after interviewing the patient is that a psychological factor *may* be producing the symptoms, but he cannot say that such a factor definitely *is* the cause. A normal individual may be 'sick with excitement', he may lose his appetite through fear, boredom may (popularly at least) give him 'a pain in the stomach'—these things any layman can corroborate. One of a sensitive make-up will react similarly to conditions of long continued excitement, to persistent anxiety, and to overwork, whilst the neuropath is in a state of continual suppressed fear or anxiety about something or nothing and the alimentary tract is a favourite site for the fixation of attention in the hypochondriac, and in the obsessional states.

Treatment must be entirely psychological, and as such it should be given only by the trained psychological expert, the practitioner's duty ending when he has made as definite a diagnosis as thorough investigation will allow. In a certain proportion the results are excellent, but the group includes many of the most hopeless, confirmed and incurable neurotics that are encountered. The following case is given by way of illustration:—

Male, aged 30 years.—This young bank clerk was referred on account of vomiting during and after meals, unassociated with pain; he had lost a considerable amount of weight, felt weak and disheartened, and was anxious about his ability to retain his post. Physical examination and the usual investigations proved negative so I sought the aid of a psychologist. It was found that the patient was the only child of elderly parents who were members of a narrow religious sect which regarded pleasure as sinful; the son had accepted these doctrines until he had become engaged, and had been led into a wider social life entailing a certain number of dinner and supper parties. These he enjoyed, but a conflict at once arose between his enjoyment of the things of the flesh and his religious conviction that such things are sinful. He began to vomit immediately after such parties, then he became nauseated before them and had to go home—at other times he was unable to swallow. Later the same symptoms arose during meals at home. By tactful psychological help his symptoms were explained to him, and after about three months he recovered completely, and has remained well apart from one mild relapse.

CHRONIC GASTRITIS

In 10 per cent of the 1,121 patients with organic disease of the stomach or duodenum I have made a diagnosis of chronic gastritis; this has been inferential as gastroscopy has not been an available method of investigation in the series studied. I have felt that organic disease of the stomach existed but had difficulty in naming the lesion except by most indirect evidence—furring of the tongue, rarely a diminution of the gastric acidity with excess of mucus (the alcoholic type is now rare), negative radiological examination of stomach and gallbladder. Probably the re-introduction of the term gastritis of recent years has led to its too free use, but nevertheless there are certain interesting clinical types.

(1) *Simulating ulcer.*—Pathological examination of stomachs, either excised at operation or specially fixed immediately after death, has clearly proved the existence of an antral gastritis or of a duodenitis giving rise to symptoms indistinguishable from those of ulcer. Clinically, such a diagnosis may be made if the symptoms of ulcer are overwhelming and the radiological examination is negative (in the duodenum, however, a negative *x*-ray must be accepted with hesitation). In a recent case the gastritis has been demonstrated gastroscopically and I am now adopting this procedure in these cases. The treatment is the same as that of peptic ulcer.

(2) *Simulating cancer.*—I have had several elderly patients complaining of loss of appetite, epigastric pain, some nausea or vomiting, and marked loss of weight in whom *x*-ray examination proved negative, and a test-meal inconclusive; I have watched them whilst they continued at home on a strict ulcer-diet, and I have seen in a few months a disappearance of symptoms, and a steady gain in weight. They have all been watched for sufficiently long to exclude any possibility of a growth, but with considerable anxiety—opportunities for pathological or gastroscopic study have been lacking.

The case quoted below is another example of this group:

Male, aged 60 years.—This man was a healthy farmer and had had no illness of note; he had had grossly infected gums and his teeth were all extracted—six weeks later he began to feel sick and fairly rapidly he developed nausea, complete loss of appetite, and vomiting with marked loss of weight. Physical

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examination was negative, a test-meal showed a very high acid curve with a trace of blood in the first specimen, and an absence of mucus; *x*-ray examination showed a deformed pylorus with some stasis. On this evidence surgical intervention was deemed essential with a diagnosis of cancer of the stomach; at operation the stomach was normal externally, and there was no sign of gallbladder disease—a chronically inflamed appendix was removed. He made a slow recovery on the usual regime for ulcer, but the only diagnosis possible was that of chronic antral gastritis. Gastroscopy at that time was not available.

(3) *The classical type.*—It is unnecessary to describe the clinical picture of alcoholic gastritis, and the similar conditions due to faulty diet, bad teeth, and other causes. There seems no sphere which so merits further study as that of gastritis, both from the points of view of ætiology, of pathology and of treatment—the latter being far from satisfactory, especially in gastritis with high acidity in which resort has even been made to the old fashioned silver nitrate treatment. I have not considered the atrophic types of gastritis with achylia—they do not appear to produce gastric symptoms, and are of interest chiefly in their relation to the anæmias.

Spastic colon

If the broad rule that gastric and duodenal disorders produce pain above the umbilicus were more generally stressed, this group would not be included; spastic colon may produce predominantly colonic symptoms—lower abdominal pain and constipation with attacks of severe colic—but it is not uncommon for a patient to complain of a pain coming on either immediately after food or some hours after and relieved by the next meal—symptoms so far resembling those of gastric or duodenal disease—but when asked to point out the site of the pain he indicates that it is below the umbilicus, extending from the right to the left iliac fossa. *X*-rays exclude a peptic ulcer but show a markedly spastic condition of the large bowel. Such cases are usually well controlled by a low-residue diet, the avoidance of irritant purgatives, and sufficient belladonna to relieve the spasm—it will be seen that they form a not inconsiderable group and account for 102 cases.

Gastroptosis and visceroptosis

These terms must remain indefinite. I have applied them to patients in whom there has been no evidence of organic disease, but who were of the hyposthenic type with a narrow costal angle, a wide pelvis, and palpable kidney or kidneys. Radiology has shown a low position of the viscera, and organic disease has not been found. Probably they would best be classified among the neuroses, but they are such a well-marked physical type that there is presumably some connection between this and their sensitive alimentary tracts—they seem to be unusually aware of the working of their abdominal autonomic nervous systems. So far as treatment is concerned, I have no contribution to make to the depressing problem.

Upper abdominal colic

This term has been applied to a group of patients who are subject to sudden attacks of severe epigastric colic of a few hours' to a few days' duration with long intervals of complete freedom. Peptic ulcer, gall-bladder disease and other obvious causes have been excluded and the diagnosis remains conjectural, doubtless some are pancreatic colic, but this is impossible to prove, the rest remain unsolved problems.

Chronic cholecystitis

I mention this group for the sake of completeness—that it comprises only 5 per cent of the whole suggests either that cases have been overlooked or that they are referred direct to the surgeons.

Reviews

THE BRITISH ENCYCLOPÆDIA OF MEDICAL PRACTICE INCLUDING MEDICINE, SURGERY, OBSTETRICS, GYNÆCOLOGY, AND OTHER SPECIAL SUBJECTS.—Edited by Sir Humphry Rolleston, Bart., G.C.V.O., K.C.B., M.D., D.Sc., D.C.L., LL.D. To be completed in eleven volumes. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Cash price—Rs. 25 per volume. Also available on the instalment system at Rs. 10 per month, price—Rs. 26-8 per volume

One of the first problems that young medical men and women have to face when they start in practice is the question of their library. They will be appalled by the number of books published each year and above all by the frequency of the appearance of fresh editions of the few books they do possess, so that they never have the satisfaction of feeling that their libraries are in any way up to date.

Whatever special line they decide to follow they will learn that they have first of all to be physicians and though they make a special study of some particular branch of medical practice they will find that they cannot divorce the knowledge they acquire from that of general medicine, and further that it is not sufficient simply to start with a sound knowledge of general medicine, but if they are to be successful they must keep this knowledge up to date. The first requisite therefore for the library of any medical man or woman is a good reference book on general medical practice and the second is some means of supplementing from time to time the information contained therein. Few can afford to discard their old (in the sense that any medical book becomes 'old' in a few years) books and purchase the latest publication, even if there is a suitable one available.

It is some years since a comprehensive and authoritative 'system of medicine' was published in Great Britain, comparable in any way to Clifford Allbutt's classical work, and it is very appropriate that the task of editing such a work should be undertaken by a physician and writer of the eminence of Sir Humphry Rolleston, who assisted Sir Clifford in the last edition of his 'system'.

The publication of a *British Encyclopædia of Medical Practice* has been undertaken by Messrs. Butterworth's, the well-known legal and medical publishers. We are now in a position to talk not of promise but of actual achievement, as already six volumes of this very important mine of medical knowledge have been published. One of the main drawbacks of a work of this kind is usually that the first volume is out of date long before the last has been published, but a feature of this publication is the very commendable promptitude with which the volumes have appeared, so that at the end of a little over a year six volumes have already been issued: the original estimate that the work would be complete in nine volumes will not however be adhered to, as the sixth volume has only taken us as far as 'J'.

This work we feel will solve the problem to which we referred in the opening paragraph of this review, of finding a really reliable and comprehensive book of reference on general medicine, and the difficulty of keeping up to date is being met by a promise on the part of the editor and publishers that supplementary volumes will be issued from time to time.

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We shall review the volumes one by one in this journal but we must first refer to the general arrangement and the format of the work. The subject-matter is arranged alphabetically and each chapter is prefaced with a summary of the subject in the form of a list of section headings, in which excellent use has been made of large type: this not only facilitates rapid reference but gives one a bird's-eye view of the subject if one proposes to read the chapter through. The page itself is an exceedingly pleasing one, the type is large and clear and the marginal captions form excellent guides without breaking up the page, and incidentally one's train of thought, as ordinary captions, when used in excess, are liable to do. The binding is serviceable but very attractive, dignified but not sombre, and it gives one the impression that it will stand up well to the ravages of India's climate and smaller fauna. The volumes are examples of the best type of British medical publication and they have a further recommendation, peculiar to British medical publications, in that they are very reasonably priced.

We very strongly recommend any of our readers who can possibly afford it to invest in this medical encyclopædia.

L. E. N.

A TEXTBOOK OF *X*-RAY DIAGNOSIS.—By British Authors. (In three volumes.) Edited by S. C. Shanks, M.D., P. Kerley, M.D., M.R.C.P., D.M.R.E., and E. W. Twining, M.R.C.S., L.R.C.P., D.M.R.E. Volume II. 1938. H. K. Lewis and Company, Limited, London. Pp. xii plus 458, with 307 illustrations. Price, £2 2s.

THE reader's attention is drawn to the review of the first volume of this very important publication in the last number of the *Gazette*.

The major portion of this volume is devoted to the alimentary tract; the subject is divided into 25 chapters which cover over 300 pages. There are four shorter sections on the biliary tract, the abdomen (the solid viscera), gynæcology, and obstetrics, respectively.

We commend particularly to clinicians the sections on normal variations in the various structures: it is tempting for the radiologist to justify his existence, and also for the clinician to justify his advice in recommending an expensive examination by finding some irregularity somewhere. A thorough knowledge of the normal picture and the possible normal variations will help him to follow the dictates of his conscience and say 'nothing abnormal found'.

The opinion expressed on the *x*-ray diagnosis of appendicitis is cautious: attention is focussed on the appendix region and the writer does not suggest, as some radiologists and surgeons do, that certain appearances in other parts of the intestinal tract point definitely to chronic appendicitis; in fact his advice to those about to have their appendices removed on *x*-ray evidence alone, can be summed up in the word 'Don't'.

When gastric carcinoma becomes clinically obvious it is too late to do anything about it. The writer suggests that an *x*-ray diagnosis can be made earlier than a clinical one. This may be true of certain types of carcinoma, but we do not think that he has established his case here, and we cannot agree that when gastric carcinoma is clinically apparent there are always unequivocal *x*-ray signs.

The same very high standard is maintained in this second volume.

MODERN TREATMENT IN GENERAL PRACTICE: A YEAR-BOOK OF DIAGNOSIS AND TREATMENT FOR THE GENERAL PRACTITIONER.—Edited by C. P. G. Wakeley, D.Sc., F.R.C.S., F.R.S.E., F.A.C.S. Volume IV, 1938. Butterworth and Company (India), Limited, Calcutta. Pp. xii plus 440. Illustrated. Price, Rs. 7

THE reprinted special articles from our very practical contemporary the *Medical Press and Circular* have proved so popular amongst general practitioners, especially amongst those in the colonies and in foreign countries, that already three series have been published. The title used for these has been *Modern Treatment in General Practice*. The publishers have now broken away from the practice of numbering these as volume I, volume II, etc., and are using the year instead to distinguish between the different series. If this change means that they are proposing to publish such a book each year, it is good news, as these books have done much to facilitate the work, and improve the scientific outlook, of the general practitioner.

The scope of the present volume is slightly wider than that of its predecessors and nearly half the articles are from the series 'Pitfalls in Diagnosis'. These articles are as practical and useful as the ones on treatment, as in most instances when an accurate diagnosis is made the treatment is automatic.

The articles range from such obviously important subjects as artificial pneumothorax in the treatment of phthisis to ones of such very great practical importance to the family physician as the treatment of chronic discharging ear in children. The *Ebers papyrus* recommends the incense of goose grease and cream from the milk of a cow, or as an alternative a concoction of asses' ears, red lead, caraway and olive oil. Mr. Charles Beney does not, but he considers that the common factor in all good treatment for the last three and a half millenia—he does not go further back than that—was *cleanliness*, and he might add *dryness*.

The quality of all the articles in this book is of the high standard that we can always count on in the *Medical Press and Circular*. There is a change in the colour of the binding to mark a slight change in policy, but otherwise the format is the same and the book is distinguished for its lightness, an important point in a book of this kind.

L. E. N.

FORENSIC MEDICINE: A TEXTBOOK FOR STUDENTS AND PRACTITIONERS.—By Sydney Smith, M.D. (Edin.), F.R.C.P. (Edin.), D.P.H. Sixth Edition. 1938. J. and A. Churchill Limited, London. Pp. xvi plus 654, with 169 illustrations. Price, 24s.

THE book is by an author with large practical knowledge, and like another excellent book on the subject was originally inspired by the wealth of medico-legal work at Cairo.

The field covered is complete. All practical details are given. Non-essential descriptions do not exist. 'The human spermatozoa', for instance, 'consists of a head, neck and tail' only. When stained as described 'details of the neck will probably not be made out'. Again, 'to avoid mushroom-poisoning the only safe rule is to leave mushrooms alone. . . . There are no simple rules for excluding poisonous varieties'.

Comments may be made on three points in chapter XI, which deals with the examination of blood-stains:—

(*i*) The second absorption band in the spectrum of hæmochromogen, in the green, does not really look broader than the first band in the yellow, in spite of the fact that the statement supported by a diagram is found in books.

(*ii*) No mention has been made of Sutherland's method of performing the precipitin test. It is undoubtedly the best. In it there is no possibility of obtaining a false reaction with monkey's serum. This point needs special comment inasmuch as legal opinion in India may be affected by the book.

(*iii*) The hypothesis of von Dungern and Hirszfeld should now be thrown overboard. Bernstein's triple allelomorphism has come to stay. Combinations, AB parent with O child and O parent with AB child, are not possible.

The size, the paper, the printing and the binding are good. No printer's errors arrest attention.

The book should be on the desk of medico-legal workers anywhere.

S. D. S. G.

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A TEXTBOOK OF MEDICINE.—By Charles Phillips Emerson, M.D. 1937. J. B. Lippincott Company, Philadelphia and London. Pp. xxv plus 1296. Price, 36s. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 27

THE range of medicine has increased so much of late that it is almost beyond the powers of a single individual to cover the whole ground himself. Sir William Osler and Sir Frederic Taylor will perhaps be the last to have made the attempt. At the same time there is a definite advantage in having only one author, so that the book does not lose its uniformity and continuity. Dr. Emerson should be congratulated for bringing out this textbook of medicine which has several unique features. Internal medicine has been presented in terms of the clinical features of the disease, which have been explained by pathological, biochemical and other findings. A disease syndrome has been regarded as the defensive process and not a mere expression of the activity of the invading organisms so that the aim of treatment should be not to suppress but to render the symptoms unnecessary. Short biographies of a few of the men to whom we are indebted for advances in medicine have been given, for better understanding of a disease in the light of historic developments. Special scientific explanatory paragraphs and footnotes have been given, which are useful.

The book is very comprehensive; omissions are remarkably few. The relative space designed to each subject is fairly proportionate, except that on anæmias, which require more attention. There are selected references at the end of each subject. Reference to Napier's work in connection with kala-azar should have been included for more accurate information regarding its diagnosis, otherwise anyone reading this section will be guided to search for Leishman-Donovan bodies also in the spinal fluid, urine and stool.

On the whole, the book is good and can be recommended to physicians and medical students.

R. C.

TEXTBOOK OF GASTROSCOPY.—By N. Henning. Translated by H. W. Rodgers, F.R.C.S. 1937. Oxford University Press, London, Humphrey Milford. Pp. 86. Illustrated. Price, 7s. 6d.

'THE study of gastric disease has long been handicapped by the lack of a method of examining the mucosa in its normal state. Post-mortem and even operation specimens are unsatisfactory, in the first because of the great change which occurs rapidly after death, and in both because of the limited nature of the material available for study. Gastroscopy has shed new light on many of our old conceptions of gastric disease, showing that some were wrong and others right. It has solved many problems for us, and raised others.'

Gastroscopy cannot be practised without a gastroscope and there are not many in India. This book, however, is important in showing us the scope of this new and important diagnostic method; small though the book is, it does this very well, with the aid of many diagrams and some very well-reproduced coloured plates.

The reviewer has seen the gastroscope in use, and, though it must take a little time to perfect the technique, it is not a difficult one and the picture of the mucosa is very clear.

We strongly recommend this book, which was originally written by a pioneer and translated by an expert in gastroscopy, to both physicians and surgeons: it will, we hope, stimulate them to introduce this method more widely in India.

THE PHYSIOLOGY OF THE KIDNEY.—By H. W. Smith, A.B., Sc.D., M.S. (Hon.). 1937. Oxford University Press, London and New York. Pp. 310. Illustrated. Price, 15s. Obtainable from Oxford University Press, Bombay and Calcutta

THIS book deals with the physiological aspects of the renal function in an able and comprehensive manner. The function of the kidney in man and other vertebrates suggests that this organ has an extraordinarily complex structure. On close anatomical analysis, however, it is found to consist of a very large number of structurally similar and relatively simple functional units

The subject of renal physiology has been a matter of controversy for a very long time. For example, the answer to the question as to what extent each of the three processes, filtration, tubular re-absorption, and tubular excretion, entered into the conservation or excretion of any particular substance by the kidney, remained unsatisfactory during all these years.

Starting from the theory of Ludwig in 1844 that the urine formation began only with a 'passive' process of filtration in the glomeruli and coming up to the theory of a 'specific vital activity' of the kidneys (by which process apparently they excrete everything through the glomeruli, only to salvage the valuable materials in the tubules, while permitting the waste products to escape), as advocated by Cushney within more recent years, we find long chapters of rival theories put in, all based on inconclusive evidence. Recently, however, Richards and his collaborators demonstrated beyond question the simultaneous existence of glomerular filtration and tubular re-absorption and Marshall and his collaborators demonstrated the existence of tubular excretion.

The author in a painstaking manner has gone into all the different theories of renal function and has given an excellent summary in chapter III which will amply repay perusal.

The book has been well written and the various functional tests of the kidneys simply and ably described; its perusal will be of use to students of medicine in arriving at an understanding of the mechanism underlying the physiology of the kidneys.

J. P. B.

TEXTBOOK OF OPHTHALMOLOGY.—By Sir W. S. Duke-Elder, M.A., D.Sc. (St. And.), Ph.D. (Lond.), M.D., Ch.B., F.R.C.S. Volume II. Clinical Methods of Examination, Congenital and Developmental Anomalies, General Pathological and Therapeutic Considerations and Diseases of the Outer Eye. 1938. Henry Kimpton, London. Pp. xxv plus 2094, with 742 illustrations, including 24 coloured plates. Price, 63s.

THE second volume of this classical book containing over one thousand pages is divided into four sections. The first section of the volume is devoted to the clinical methods of examination of the eye and contains chapters on the objective and subjective examinations. Section two is devoted to the ætiology of deformities, the gross developmental anomalies affecting the eye as a whole and the developmental and congenital anomalies affecting individual structures of the eye, with their pathology and treatment. Section three contains chapters on the diseases of the corneal epithelium, diseases of the cornea and finally one on diseases of the sclera. The methods of examination, deformities and diseases of the eyes are discussed in great detail. The volume has 742 illustrations and 24 coloured plates which are all excellent. These are mostly borrowed, but in each case the source has been generously indicated.

An interesting part of the book is the introduction of photographs of eminent ophthalmologists and in this volume we find those of von Graefe, Treacher Collins, Fuchs, Axenfeld, Morax and Johnathan Hutchinson. There is also an extensive list of references in each chapter.

The book is beyond praise and one marvels at the enormous amount of work involved in producing so great an achievement. The author is certainly deserving of the highest praise and congratulations, and the whole of the English-speaking world owe him a debt of gratitude, as in our opinion it is the best book on ophthalmology written in the English language. As a book of reference all other textbooks on ophthalmology fade into insignificance. We strongly recommend it to

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every medical man who is interested in eye work in India.

E. O'G. K.

TREATMENT BY DIET.—By Clifford J. Barborka, B.S., M.D., D.Sc., F.A.C.P. Third Edition. 1937. J. B. Lippincott Company, Philadelphia and London. Pp. xiv plus 642. Illustrated. Price, 21s. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 15-12

WITHIN the last few years our scientific knowledge of vitamin content, mineral elements and other constituents of food has increased considerably. The application of this knowledge to the treatment of disease is becoming more comprehensive each year, and diet therapy at present forms an important factor in the treatment of many diseases. The appearance of the third edition of Dr. Barborka's book shows its demand.

The book presents a practical and systematic method of prescribing diets and contains an abundance of English menus. It is divided into a preliminary part dealing with the dietetic principles in health, followed by sections on diet therapy in various diseases which have been divided into two groups, *viz*, the diseases such as diabetes mellitus, gout, etc., in which diet is of paramount importance and the ones, such as tuberculosis, hypertension, etc., in which diet is of varying importance. There are introductory notes in each section explaining the nature of each disease and the rationale of the diet to be prescribed.

A few new additions have been incorporated in this edition; for instance, a discussion of the present status of the clinical aspects of the vitamins has been added, the present conception of protamine zinc insulin is given; and the discussion on obesity has been broadened.

There are a few comments to be made. Treatment of sprue is inadequate; only one diet with carbohydrate content of 150 grammes has been given. There is no reference to alcohol intake in connection with the reducing diet for obesity. Infant diets have not been dealt with.

There is a useful appendix and a bibliography at the end of the book. The get-up of the volume is good.

R. C.

SISHU-KHADYA (DIETETICS FOR THE CHILDREN).—Written in Bengali. By Dr. B. B. Pal, L.M.S. First Edition. (Pravasi Press, Calcutta.) 1938. Published by Bijoy Bhusan Pal, 39-5A, Gopalnagar Road, Alipur, Calcutta. Pp. 102. Price, Re. 1

IN view of the scarcity of Bengali books on infant feeding, based on scientific knowledge, this booklet is welcome. It deals, in brief, with proximate principles of food, breast feeding, artificial feeding, ante-natal care, teething, etc. Various proprietary foods have been recommended, but without practical instructions as to the method of their use and dosage. More emphasis should have been laid on the necessity for the regular use of vitamins in the diet.

R. C.

LIPPINCOTT'S QUICK REFERENCE BOOK FOR NURSES. COMPILED AND ARRANGED FROM VARIOUS SOURCES.—By H. Young, R.N. With the assistance of G. A. Morrison, R.N., and M. Eliot, R.N. Third Edition. 1937. J. B. Lippincott Company, Philadelphia and London. Price, 9s. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 6-12

THIS is a most valuable book for trained and student nurses.

It contains general information which the nurse in training will find most helpful, especially the student nurse studying for the final examination.

The description of various methods of administering treatment is of value and interest, especially that on oxygen therapy and the description of and most useful information on sulfanilamides.

The charts at the back and front, one on the symptoms and treatment of poisons and the other on the common contagious diseases, are extremely helpful.

This book well deserves the title of 'Quick Reference', and we strongly advise all nurses to procure a copy as soon as possible.

E. M. C.

MEDICAL RESEARCH COUNCIL: SPECIAL REPORT SERIES, NO. 229. 'A CLINICAL AND GENETIC STUDY OF 1,280 CASES OF MENTAL DEFECT'. —By L. S. Penrose. 1938. Published by His Majesty's Stationery Office, London. Pp. 159. Price, 2s. 6d.

'No less than the administrative authorities, the Medical Research Council have been aware of the importance of mental defect as a social problem, and they have constantly desired to promote investigations which would throw light on its causes. They have recognized that lack of knowledge may be the main limiting factor in combating this evil, and that such knowledge can come only by means of skilfully-directed research.'

The Council agreed to co-operate with the Darwin Trust in supporting work on this subject by Dr. L. S. Penrose who has now studied, clinically and genetically, a representative group of 1,280 patients of all grades and types of mental deficiency. The present report contains the results of this extensive and prolonged investigation.

'It is of interest to note that the incidence of defect amongst parents and "sibs" of patients was estimated to be as high as from 7 to 9 per cent (the incidence amongst the patients' own children being much higher), and that this exceeds by some 6 to 8 per cent the figures for the population in general.'

'As regards the general deductions of this extensive inquiry, Dr. Penrose found no unequivocal evidence of sex-linked genes (inheritance factors) in the causation of mental defect. On the other hand, there was definite evidence in favour of Mendelian recessivity and dominance respectively in some of the rarer conditions he found among these patients, such as phenylketonuria, cretinism, microcephaly and cerebral diplegia.'

'His data and results will also be of exceptional interest to students in other fields of pure and applied science. It can be claimed that these researches constitute a new and refreshing approach to the old and much discussed problem of the relative rôles of heredity and environment in the development of the human race.'

THE DIRECTORY OF BRITISH HEALTH RESORTS, 1938: OFFICIAL HANDBOOK OF THE HEALTH RESORTS ASSOCIATION.—Edited for the Association by R. F. Fox, M.D. (Lond.), F.R.C.P., F.R.Met.S. Published by J. and A. Churchill, Limited, London. Pp. 288. Illustrated. Price, 2s. 6d.

THIS is not a commercial publication sold for profit but is issued by the British Health Resorts Association, Limited, a voluntary body which exists not to make money but to perform a national service in instructing the public in the health resorts that are available in the British Isles. This is a distinct service, for it is a popular idea amongst the public, and to some extent, among members of the medical profession, that one must go abroad to obtain efficient spa treatment. Perusal of this book will speedily disabuse a mind so misinformed.

It is a book that will be of use to all practitioners in the British Isles because they can find in it an appropriate place to recommend to their patients who are convalescing or suffering from any chronic complaints that are likely to be benefited by any special form of treatment or environment that is indicated.

It will also be of use to doctors overseas who may have patients proposing to visit Great Britain, as it will enable them to advise them where is the best place

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to go if they are proceeding home on grounds of ill health. There are also notes on the main climatic features of the dominions and the principal colonies of the Empire and an indication of what special mineral springs, etc., may be found there.

The last 100 pages are devoted to advertisements of hotels in the various resorts which, according to a note on page 11 of the handbook, are vouched for by the association as well run establishments.

MALARIA IN EUROPE: AN ECOLOGICAL STUDY.—By L. W. Hackett, M.D., Dr.P.H. 1937. Oxford University Press, London, Humphrey Milford. Pp. xvi plus 336. Illustrated. Price, 10s. 6d. Obtainable from Oxford University Press, Bombay and Calcutta

THIS book is so pregnant with thought, nearly every line being a concentrate of wisdom, that it does not lend itself to review.

One must simply say that to read it must humble anyone whose tendency is to be dogmatic. Like Zinsser's book *Rats, Lice and History* it is a model of an epidemiological study and to read it must elevate the merely mechanical executive medical officer to a higher plane, in fact to quite another plane.

C. S.

MEDICAL RESEARCH COUNCIL: SPECIAL REPORT SERIES, NO. 230. 'THE CHEMISTRY OF ANTIGENS AND ANTIBODIES'.—By J. R. Marrack. 1938. Published by His Majesty's Stationery Office, London. Pp. 194. Illustrated. Price, 3s.

MEDICAL bacteriologists are of necessity closely concerned with chemical studies which may lead to fuller knowledge of the conditions of life of pathogenic micro-organisms, or to better understanding of the responses—often highly specific—which these organisms evoke when they invade the human body. Work on these lines, if progress is to be made, must obviously take account of fundamental advances in the science of chemistry, and it is therefore important that knowledge of these advances and of their bearing on the special problem should be made readily available to the investigators. Dr. Marrack has accordingly collected the more important results of recent experimental work upon the chemistry of antigens and anti-bodies, and has reviewed that subject in the light of present-day knowledge of molecular structure.

KEESING'S MEDICAL DIGEST. Published by Messrs. Keesing's Medical Digest Limited, 1, Regent Street, London, S.W.1. The Subscription is very low, being one guinea for Great Britain (two years £1-18-6) and £1-5-0 (two years £2-5-0) abroad, postages and a new binder for every year, included. (Publishers are willing to send a specimen volume for perusal to everyone who asks for it, without any cost or obligation)

THE 'digest' habit is growing in all forms of literature. In this connection the name of Keesing is well known. They have now issued a medical digest which is combined with a diary, the whole forming a very handy book that can easily be slipped into the pocket. Each month they issue about 32 pages of 'digest' of recent work likely to be of value to the practitioner. It is printed on very thin but opaque paper in a small-page form. A three-monthly index is issued. There is also a diary with a full page for each day and special forms for confinements and cash accounts. All these are held together by a very neat and serviceable spring-hinged cover.

The idea is a good one and well executed. The extracts given in the first three months of the 'digest' that have so far been received are practical and are taken from a representative collection of journals of several countries.

Abstracts from Reports

THE SEVENTH ANNUAL REPORT OF THE ASSOCIATION FOR THE PREVENTION OF BLINDNESS, BENGAL, 1936-37

THE Committee of the Association for the Prevention of Blindness, Bengal, have great pleasure in presenting the Annual Report of the Association which has recently completed the seventh year of its existence. It started in the year 1930 under the patronage of the Hon'ble Lady Jackson and has had to surmount great difficulties in the way of finance and provision of propaganda material. It has now grown into one of the public utility services in Bengal and has amply justified its existence by the amount and quality of the service rendered and it is gratifying to know that the lay public are becoming more awake to the importance of prevention of blindness and the cure of eye disease. From all districts in Bengal appeals for assistance are being received but owing to limited finances many have to be turned down.

It is a matter of congratulation for everyone connected with the movement that Her Excellency the Marchioness of Linlithgow has graciously consented to become the patroness of the association. Her Excellency's patronage should give a big stimulus to greater efforts in this worthy cause.

One of the principal aims of the association was achieved during the year, namely, the organization of a first travelling eye dispensary, which is the first of its kind in India. The dispensary, called the 'Jubilee Travelling Eye Dispensary', started on the 28th March, 1936, with the object of preaching the gospel of prevention of blindness and bringing the benefits of modern ophthalmology to the very doors of the people in remote villages. This travelling eye dispensary has proved to be a tremendous success and from every sub-division in which it has worked glowing reports were received of its popularity and usefulness. The committee were inundated with letters and telegrams begging that the dispensary might be kept longer in the area in which it was working. As much ground had to be covered, only three months could be allotted to each district. May the day be not long distant when the aim of the committee is accomplished, to establish in Bengal one travelling eye dispensary for each division, namely, five in all.

The committee hope in the coming year to start a travelling boat eye dispensary in East Bengal to work on the same lines as 'The Jubilee Travelling Motor Eye Dispensary' using the rivers instead of the roads to bring the benefits of modern ophthalmology to the remote villages and to *teach* methods of prevention of blindness.

In the campaign for the prevention of blindness it is perhaps not yet realized that the problem is largely one of the prosperity of the people and the great bulk of preventable blindness will gradually diminish as the standard of living improves. If the standards of living throughout India were the same as in Europe then the problem of blindness would be the same as in Europe. Speaking broadly, the prevention of blindness in India is not a medical problem but a social, economic and financial one.

It is gratifying to know that His Excellency the Viceroy has made it his ambition to make the Indian countryside a better and happier place to live in and large sums of money have already been set aside for financing schemes in rural areas which aim particularly at providing a good water supply, improved sanitation, and improved methods in the breeding of cattle.

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Other noticeable improvements are the establishment of union board dispensaries, better roads, village schools, libraries and playing grounds for rural schools.

From every quarter one sees evidence that Governments are concentrating their activities on rural development, which has been so neglected in the past. The fulfilment of these schemes must lead to a general improvement in the health of the people and as a necessary corollary a diminution in the amount of preventable blindness.

Take, for example, the disease keratomalacia, one of the great causes of preventable blindness in children. It is due to lack of fat in food and, with improvement in the standard of living and public health, will gradually disappear. At present all that the medical department can do is to provide cod liver oil to the few who come to the hospitals for treatment.

At present the Government is not prepared to spend money directly on prevention of blindness but by the development of rural areas it has commenced to spend it indirectly.

The problem of prevention of blindness in general is so immense, it is important to face facts and realize that the remedy cannot be successful for many years and that the most important work of an association for the prevention of blindness is to bring home to the members of the administration and the people in general the importance of prevention of blindness and the cure of eye diseases and suggest remedies for prevention and cure.

PROPAGANDA

Propaganda activities have considerably increased during the year under review. These have been rendered possible on a wider scale in the *mofussil* by the travelling eye dispensary which did splendid work in the three districts it toured during the year.

Posters form one of the most important vehicles of propagating instruction in methods of prevention. They are simple, attractively colourful and have succeeded in attracting the attention of the public. They were freely distributed through the Bengal Branch of the Indian Red Cross Society and the Jubilee Eye Dispensary and to Health Exhibitions, various hospitals, *mofussil* dispensaries, to medical men and others interested in the movement of prevention of blindness.

Magic lantern slides form another very important part of propaganda work. The association possesses two magic lantern slide lectures entitled:—

(1) 'Care of the Eyes', with 32 slides.
(2) 'Prevention of Blindness', with 54 slides.

These slides have been made locally and copies together with copies of the lectures can be obtained by applying to the Honorary Secretary at the office of the Association for the Prevention of Blindness, Bengal, at the Eye Infirmary, Medical College Hospitals, Calcutta.

Popular lectures are regularly given by trained eye doctors in schools, colleges, and other places under the supervision of the honorary secretary of the association. These lectures are essentially practical and consist of simple methods of prevention and treatment together with magic lantern slide demonstrations and they are delivered according to the special syllabus prepared and printed for the guidance of the lecturers. They have been greatly appreciated and have been found most useful for educating teachers and their pupils in methods of prevention of blindness. The cost of those lectures has been met by a grant from the Indian Red Cross Society. Each lecturer is paid Rs. 20 for a course of two lectures. Many lectures were also delivered in the districts of Burdwan, Birbhum and Bankura by the Medical Officer-in-Charge of the Jubilee Travelling Eye Dispensary whilst working in those places.

The cinema film in two reels entitled 'Lamps of Life' has been shown freely in different places in Calcutta and in the *mofussil*. Copies have been lent for exhibitions and health exhibitions and a copy can always be obtained on loan from the registered office of the association.

The association is well equipped with booklets on subjects which are important in the prevention of blindness and the care of eye diseases. They are written by ophthalmologists in a very simple language and are well illustrated. These booklets are being gradually translated into Bengali and Urdu. Requests for copies of these booklets and posters keep coming from different parts in and outside Bengal.

The association as usual took a prominent part in the Annual Health Week Exhibition held at the Museum in Calcutta and in many other health exhibitions held in and outside Calcutta. It provided models, posters, booklets, magic lantern slides and films, etc. A trained ophthalmologist was put in charge who gave demonstrations and delivered lantern lectures.

It is unfortunate that India is so backward in the development of broadcasting, as in other countries it has proved a tremendous weapon for propaganda purposes and its uses in prevention of blindness would be enormous.

Occasional lectures have been delivered from the Calcutta Broadcasting Station but the people whom broadcasting at present reaches are few.

During the year epidemic dropsy was prevalent in many parts of Bengal, outbreaks also occurred in parts of Bihar, the United Provinces and Burma. The disease is almost exclusively confined to Bengalees. It is more commonly called beri-beri by the public although it is an entirely different disease. Beri-beri is due to food deficient in Vitamin 'B', whilst epidemic dropsy is a bowel disease associated with the ingestion of diseased, stored, parboiled rice or according to some authorities of impure mustard oil.

As pointed out in last year's report, glaucoma is a frequent complication of epidemic dropsy and is one of the worst diseases that can affect the eyes and unless the correct treatment is given it leads to partial and often complete blindness. It is a disease that can to a large extent be prevented and information for its prevention and cure has been disseminated on many occasions through the lay papers and the radio.

Large numbers of patients suffering from epidemic dropsy and glaucoma in all its stages present themselves at the various hospitals in Calcutta for treatment.

If one visits the various out-patients' departments at the eye hospitals in Calcutta, one sees piteous sights of children, adults, middle-aged and old people blinded by this disease. Surely it is a Bengal tragedy. A booklet on epidemic dropsy and glaucoma has been brought out by the association and copies can be obtained on request.

FINANCE

In the General Fund, the total receipts including the opening balance for the year were Rs. 12,619-3-4 against Rs. 7,750-15-3 of the previous year and the expenditure was Rs. 5,258-3-3 against Rs. 4,352-7-3 of the previous year, and increase in income was mainly due to more members enlisted and donations received.

Subscriptions and donations in 1936–37 amounted to Rs. 3,367-4-3.

The association has safely passed through the difficult stage of infancy owing to the magnificent efforts of honorary workers who have spared no pains to see the association grow to its present position and usefulness. The activities have greatly extended and spread to different spheres in the year under report. One travelling eye dispensary has been established and plans are far advanced to start a boat travelling eye dispensary in East Bengal which it is hoped will come into existence in the middle of 1937. Much, however, requires to be done and the committee are fully alive to the fact. Funds are required and it is hoped that the committee will not be hampered by lack of these. The cause is a noble and worthy one. An extract from an article by the Editor, *Indian Medical Gazette,* of February 1937, is here not out of place:—

'The above extract shows what a live and progressive body this association is and that in the six years of its existence it has maintained its progress in spite of the fact that this period included the worst years of

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trade depression when even firmly established charitable organizations suffered severely. The executive of this association is to be congratulated on the manner in which it is steadily expanding its activities and we know of no more worthy object to which the charitably minded might subscribe, for it is clear from this report that any funds available are carefully spent so that the subscriber can feel assured his money is being expended in full for the object for which it was given'.

[We feel we cannot do better than endorse the remarks quoted above as they are equally applicable to the seventh year's work of this important association.]

THE REPORT ON THE WORKING OF HOSPITALS AND DISPENSARIES IN THE PUNJAB FOR THE YEAR 1936

DUE to financial stringency the year 1936, like its predecessor, has been an uneventful one so far as new developments and expansion of medical relief are concerned. No hospital was provincialized during the year. Normal activities of the department, however, show encouraging results. Five new dispensaries were opened and three of those already existing were closed during 1936, thus raising the total number to 961, of which 687 are in rural areas. Available accommodation for in-patients in hospitals open to the public was increased by 342 beds, of which Jullundur district alone claimed 148, and Lahore 48, as a result of the opening of the Rai Bahadur Amar Nath Tuberculosis Institute attached to the Mayo Hospital, Lahore. The scheme of subsidized dispensaries is on its trial. The annual cost of such a dispensary is estimated at Rs. 1,100 as against Rs. 2,500 of a rural dispensary. At present the entire cost of maintenance of rural dispensaries is borne by Government and it is highly desirable for local bodies to exert themselves to provide funds for the opening of new dispensaries in areas where medical relief is not adequate.

The total number of in-patients and out-patients treated shows an increase of 7.85 lacs as compared with the previous year. Due to heavier rains malaria was more prevalent during the year under report and accounts for an increase of 1.48 lacs out of the total number given above. Next to malaria, diseases of the ear and skin showed the largest increase and the least and only an insignificant increase was recorded in the number of tuberculous patients. The Inspector-General of Civil Hospitals rightly remarks that the figure recorded is not a true indication of the extent to which unfortunately tuberculosis is prevalent. The total number of surgical operations performed showed an increase of 14,278 over the previous year's figure of 592,442, the percentage of deaths remaining constant at 0.20.

The expenditure of the department increased by Rs. 1,39,844 to Rs. 51,32,145, the increase being mainly accounted for by repairs and renewals of apparatus (Rs. 40,227) and the annual increments of the staff (Rs. 47,326). As usual, little income was received from fees. The standard rules for charging fees from well-to-do patients introduced in August 1935 have not proved a success so far, partly because the public have long been pampered by free medical treatment and partly because the local bodies have not followed the lead. Excluding a sum of Rs. 40,000 received from Their Majesties' Silver Jubilee Fund and Rs. 7,500 from the Killa Gift Fund, Lyallpur, instances of public charity were fewer than last year.

The addition of Rai Bahadur Amar Nath Tuberculosis Institute as a self-contained unit for the treatment of tuberculous patients, both in-door and out-door, is a valuable addition to the usefulness of the Mayo Hospital, Lahore, which maintained its popularity for treatment on the most up-to-date and modern lines. The hospital has an *x*-ray and electrical department of its own. The existing apparatus is shortly to be replaced by a new one at a cost of Rs. 93,000. The surgical work done in the civil hospital, Amritsar, covers a wide field and of the total operations, which numbered 5,955, cataract accounted for as many as 2,143. Difficulties are reported in accommodating in-patients during the 'eye-season'. This indicates the necessity of building an ophthalmic hospital and relieving the congestion in the main hospital. The proposal for extension of accommodation will be considered when the financial position of the province permits. The Ripon Hospital at Simla also continues to be handicapped by lack of accommodation. Proposals for its expansion are under consideration. The Lady Willingdon Hospital, Lahore, is now popular with all classes of the public, the daily average attendance being 92.61. Six hundred and fifty-four labour cases were treated during the year under report. This number provides clinical material for 48 students only, while the total number of students to be trained every year is 77. It was, therefore, necessary to make arrangements for the training of the rest of the students at Madras. This is only a makeshift arrangement, the permanent solution being to increase accommodation of in-patients in the hospital in order to train all the students of the King Edward Medical College, Lahore. Proposals are under the consideration of the Inspector-General of Civil Hospitals for providing additional accommodation for 116 in-patients on the present site or for building a new hospital for 200 patients on another site. The Teka Devi Health Centre has been completed and is now ready for the reception of patients. The provision of radium at a cost of Rs. 40,000, sanctioned from His Late Majesty's Silver Jubilee Fund, has proved very useful in the treatment of carcinoma cervix uteri. Forty-five such cases were treated in 1936 against 26 in the previous year. The popularity of the Lady Aitchison Hospital, Lahore, can be judged from the fact that the average daily attendance of new patients in the out-patient department went up from 86.01 in 1932 to 140.40 in 1936. The existing staff of the Punjab Dental Hospital is reported to be insufficient to cope with the work, and it may be necessary to appoint additional dental surgeons if the work goes on increasing at this pace. The Lady Hailey Women's Hospital, Bhiwani, and Memorial Mission Hospital, Ludhiana, are doing splendid work in the cause of medical aid for women. The arrangements made at the latter hospital for the treatment of pulmonary tuberculosis are reported to be excellent. All these hospitals maintained a creditable standard of efficiency in spite of the handicaps under which some of them had to work for financial reasons.

A sum of Rs. 60,826 was paid by Government during 1936–37 towards the maintenance of the inmates of the five leper homes in the Punjab, as compared with Rs. 59,400 during 1935-36. The scheme for the establishment of a settlement for 'burnt out' cases in the Lower Bari Doab Colony, mentioned in the last year's review, had to be dropped as unworkable.

New hospitals at Ludhiana, Jagraon and Alipur will be built in the near future, as the existing buildings are in a bad condition. Government have read with regret that local bodies are not doing their duty so far as improvements to hospital buildings in their charge are concerned. They are said to be content to look forward to the day when the provincialization scheme will shift the responsibility of their reconstruction on to Government. There are 66 hospitals and dispensaries maintained by local bodies that still remain to be provincialized, as and when provincial finances permit. The process of taking over by Government will of necessity have to be spread over a number of years and meanwhile it is highly desirable that local bodies should keep these public buildings in a proper state of repair.

The year shows a remarkable increase in the number of women patients, both indoor and outdoor. Thanks to the combined efforts of the Medical, Public Health, Education and Rural Reconstruction Departments and Indian Red Cross Society, there are signs of a general awakening in the public, who have begun to realize the necessity of the proper medical aid for their womenfolk. This has brought to the fore the problem

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of making adequate provision for female medical aid to meet the growing demand. Separate women's hospitals exist in a few district headquarters, while the rest have women sub-assistant surgeons in charge of women's sections attached to main hospitals. Jhelum has neither, but it has the Mission Hospital where the arrangements for female medical aid by lady doctors exist. About two-thirds of the *Tehsil* headquarters hospitals and dispensaries have no arrangements for the treatment of women patients by doctors of their own sex. The inadequacy of the provision for proper female medical aid is clear, and it should receive due consideration in any future scheme of expansion.

Medical education is becoming increasingly popular among girl students and a fairly large number of them have to be refused admission every year for want of accommodation. During the year 5 women students qualified for the M.B., B.S. degree and 26 passed the L.S.M.F. diploma. Two hundred and thirty-three women qualified for I.D.S. (Indigenous Dais Certificate), 66 for N.D.S. (Nurse Dais Certificate) and 45 for D.M. (Diploma in Midwifery).

PROCEEDINGS OF THE ALL-INDIA OPHTHALMOLOGICAL SOCIETY, VOLUME V, SESSION 1936, MADRAS

THE report of the fifth conference of the All-India Ophthalmological Society held at Lahore in December 1936 has just reached us. The report of the meeting and the presidential address occupy only about 15 pages at the end of the volume, the other 256 pages being devoted to the 43 papers read at the conference. This is always a well-bound and well-printed publication and the illustrations in the papers are well executed. The papers cover a wide field of ophthalmology so that this annual volume gives a valuable epitome of the work and progress in ophthalmology in India where it is a subject of such great importance.

Service Notes

APPOINTMENTS AND TRANSFERS

MAJOR-GENERAL N. M. WILSON, O.B.E., K.H.S., Surgeon-General with the Government of Madras, is appointed to officiate as Director-General, Indian Medical Service, with effect from the 27th May, 1938, *vice* Major-General E. W. C. Bradfield granted leave.

Colonel D. H. Rai, M.C., Inspector-General of Civil Hospitals, C. P. and Berar, has been appointed to act as Director of Public Health, C. P. and Berar, in addition to his own duties, with effect from 19th April, 1938, *vice* Lieutenant-Colonel S. N. Makand granted leave.

Colonel A. C. Munro to be officiating D. D. M. S., A. H. Q. Dated 13th May, 1938.

Colonel S. G. S. Haughton, C.I.E., O.B.E., K.H.S., to be Officiating D. D. M. S., Eastern Command. Dated 1st April, 1938.

Lieutenant-Colonel H. E. Shortt, Director of King Institute, Guindy, to act as Surgeon-General with the Government of Madras, with effect from the date of taking charge, *vice* Major-General N. M. Wilson, O.B.E., K.H.S., on other duty.

Lieutenant-Colonel H. E. Shortt, Acting Surgeon-General, Madras, to officiate temporarily as the Director of Public Health, Madras, in addition to his own duties, with effect from the date of taking charge, until further orders.

Lieutenant-Colonel V. Mahadevan, Surgeon, First District Superintendent and Lecturer in Surgery, Stanley Medical School, Madras, First Surgeon, Government Rayapuram Hospital, Superintendent, Raja Sir Ramaswami Mudaliyar Lying-in-Hospital, and President, Board of Examiners, Madras, to act as Professor of Operative Surgery, Medical College, and Surgeon, Government General Hospital, Madras, with effect from the date of taking charge, *vice* Captain Sangham Lal.

Lieutenant-Colonel S. C. Alagappan, Acting District Medical Officer, Superintendent, District Headquarters Hospital, Salem, to act as Surgeon, First District Superintendent and Lecturer in Surgery, Stanley Medical School, First Surgeon, Rayapuram Hospital, Superintendent, Raja Sir Ramaswami Mudaliyar Lying-in-Hospital, and President, Board of Examiners, Madras, with effect from the date of taking charge, *vice* Lieutenant-Colonel V. Mahadevan.

Lieutenant-Colonel R. C. Clifford, M.C., D.S.O., is appointed to the post of Civil Surgeon, Simla West, with effect from the forenoon of the 20th April, 1938.

On his return from leave, Lieutenant-Colonel E. C. A Smith has been reappointed as Superintendent, Central Mental Hospital, Yeravda, with effect from the forenoon of 3rd June, 1938.

Lieutenant-Colonel B. Z. Shah took over charge of the office of Director of Health and Prison Services, Sind, Karachi, from Lieutenant-Colonel B. F. Eminson, on the afternoon of the 30th April, 1938.

Lieutenant-Colonel H. H. Brown to be D. D. M. O. W., Army Headquarters. Dated 28th April, 1938.

Lieutenant-Colonel F. Phelan to be Officiating A. D. M. S., Lucknow Dist. Dated 2nd April, 1938.

Lieutenant-Colonel P. Banerjee made over charge of the Burdwan Jail to Lieutenant-Colonel N. C. Kapur, on the forenoon of the 23rd April, 1938.

Lieutenant-Colonel N. C. Kapur made over charge of the Chittagong Jail to Captain John Brebner, on the afternoon of the 19th April, 1938.

Major W. Aitchison, Civil Surgeon, Cawnpore, returned from leave on 4th April, 1938.

Major B. J. Griffiths, Civil Surgeon, from Jhansi to Agra, from 8th April, 1938.

Major L. F. Burns to be Officiating D. A. D. M. S. (Mob.), Western Command. Dated 2nd May, 1938.

Major K. H. A. Gross, an Officiating Agency Surgeon, is posted as Agency Surgeon in Bundelkhand, with effect from the afternoon of the 4th May, 1938.

Major D. P. Lambert, on return from leave, is posted as Civil Surgeon, Fyzabad, from 5th May, 1938.

On return from leave Major G. Joyce assumed charge of the office of Civil Surgeon, Lyallpur, on the 26th May, 1938.

Captain R. De Soldenhoff has been appointed to officiate as Professor of Midwifery and Gynæcology, Grant Medical College, and Senior Specialist in Obstetrics with Gynæcology, Bai Motlibai and Sir D. M. Petit Hospitals, Bombay, pending further orders, with effect from the afternoon of 4th June, 1938, *vice* Lieutenant-Colonel W. C. Spackman granted leave

Captain C. B. Miller has been appointed to officiate as Resident Medical Officer and Junior Specialist in Obstetrics with Gynæcology, St. George's Hospital, Bombay, pending further orders, with effect from the forenoon of 3rd June, 1938, *vice* Captain R. De Soldenhoff.

Captain Sangham Lal, Acting Professor of Operative Surgery, Medical College, and Surgeon, Government General Hospital, Madras, to act as District Medical Officer, Salem, and Superintendent, District Headquarters Hospital, Salem, and Medical Officer, Central Jail, Salem, with effect from the date of taking charge, *vice* Lieutenant-Colonel S. C. Alagappan.

Transferred to Civil Employment

Captain F. R. Cawthorn, on 8th April, 1938, as Agency Surgeon, Kurram.

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Captain P. I. Franks, on 11th April, 1938, as Surgeon to H. E. the Governor of Bengal.

Captain G. P. Charlewood, on 17th April, 1938, as Civil Surgeon, Coorg.

Captain S. W. Allinson, on 17th April, 1938, to Civil Burma.

Captain J. G. Stonham, on 18th April, 1938, to Civil Burma.

Captain A. M. Sheridan, Civil Surgeon, from Cawnpore to Moradabad, from 11th April, 1938.

Captain V. Srinivasan, Civil Surgeon, Bilaspur, has been transferred to Jubbulpore where he assumed charge on the afternoon of 12th May, 1938.

LEAVE

Major-General E. W. C. Bradfield, C.I.E., O.B.E., K.H.S., Director-General, Indian Medical Service, is granted provisionally combined leave for 3 months and 21 days, with effect from the 27th May, 1938.

Major-General I. M. Macrae, C.I.E., O.B.E., K.H.P., D. D. M. S., Eastern Command, proceeded on 5 months and 14 days' combined leave *ex*-India, with effect from the 1st April, 1938.

Colonel A. A. C. McNeill, K.H.S., D. D. M. S., Army Headquarters, proceeded on 4 months and 5 days' combined leave *ex*-India, with effect from the 13th May, 1938.

Colonel W. E. R. Williams, O.B.E., V.H.S., proceeded on 6 months' combined leave *ex*-India, with effect from the 2nd April, 1938.

Colonel J. Scott, D.S.O., O.B.E., D. D. M. O. W., Army Headquarters, proceeded on 6 months' leave on medical certificate *ex*-India, with effect from the 16th April, 1938.

Lieutenant-Colonel A. H. Shaikh proceeded on 9 months' leave *ex*-India, from 14th January, 1938.

Lieutenant-Colonel P. N. Basu, Civil Surgeon, Rae Bareli, has been granted leave on average pay for 8 months partly in and partly out of India, from 6th April, 1938.

Lieutenant-Colonel R. E. Flowerdew, C.I.E., O. C., C. I. M. H., Bannu, proceeded on 12 months' combined leave *ex*-India, with effect from the 16th April, 1938, pending retirement.

Lieutenant-Colonel B. S. Dhondy, O. C., I. M. S., Ferozepore, proceeded on 8 months' combined leave in India, on 2nd May, 1938.

Lieutenant-Colonel S. M. A. Faruki, Specialist in Ophthalmology, Rawalpindi, proceeded on 4 months' combined leave *ex*-India, with effect from the 11th May, 1938.

Lieutenant-Colonel J. M. R. Hennessy, Civil Surgeon, Jubbulpore, has been granted leave on average pay for 4 months *ex*-India, from 13th May, 1938.

Lieutenant-Colonel W. C. Spackman, Professor of Midwifery and Gynæcology, Grant Medical College, and Senior Specialist in Obstetrics with Gynæcology, Bai Motlibai and Sir D. M. Petit Hospitals, Bombay, has been granted leave on average pay for 4 months and 4 days followed by leave on half-average pay for 3 months and 27 days, with effect from the afternoon of the 4th June, 1938.

Lieutenant-Colonel H. Chand, Civil Surgeon, Jullundur, proceeded on leave on average pay for 2 months, with effect from the 13th May, 1938.

Lieutenant-Colonel F. J. Anderson, Professor of Surgery, Medical College, Calcutta, is granted leave *ex*-India for the period 23rd May to the 22nd July, 1938.

Major S. C. H. Worseldine, Civil Surgeon, Fyzabad, has been granted 1 year's leave from 24th March, 1938.

Captain H. S. Smithwick, Civil Surgeon, Sholapur, has been granted leave on average pay for 8 months, with effect from the afternoon of 3rd May, 1938.

PROMOTIONS

Captains to be Majors

G. R. M. Apsey. Dated 22nd May, 1938.

J. H. Boultbee, Civil Surgeon, Gorakhpur. Dated 29th April, 1938.

Lieutenants to be Captains

W. A. Hopkins. Dated 8th January, 1938, with seniority from 31st August, 1937.

J. L. Mewton. Dated 9th January, 1938, with seniority from 1st March, 1937.

J. W. R. Sarkies. Dated 9th January, 1938, with seniority from 31st August, 1937.

L. U. Kamm. Dated 9th January, 1938, with seniority from 31st August, 1937.

T. Denness. Dated 10th January, 1938, with seniority from 31st August, 1937.

RETIREMENTS

Lieutenant-Colonel Som Dutt, M.C. Dated 28th March, 1938.

Lieutenant-Colonel J. B. de W. Molony, O.B.E. Dated 3rd April, 1938.

Lieutenant-Colonel A. J. Symes. Dated 12th April, 1938.

Notes

PHOTOGRAPHING SECTIONS OF THE HUMAN BODY

By A. LION

TOMOGRAPHY—AN IMPORTANT ADVANCEMENT IN THE FIELD OF *X*-RAY PHOTOGRAPHY

WHEN taking a photograph with long exposure, such as, for instance, when photographing a quiet street in the dusk, it does not matter if some one should pass before the camera while the picture is being taken, as he will not show on the plate. Compared to the long exposure, the brief moment while this person passes in front of the camera is too short; the person will be considerably underexposed and even in the most unfavourable condition he will appear in the picture only as hardly more than a shadow. This fact is known to every amateur photographer, and there would be no reason in mentioning it, if it had not recently been put to a novel use in the field of *x*-ray photography.

In taking *x*-ray pictures, the whole depth of the body is photographed instead of the surface of an object, as is the case in ordinary camera work. All layers of the object which lie behind each other in the path of the *x*-ray are shown summarily in a single plane, that of the *x*-ray film regardless of whether the object is a human body or a piece of metal casting to be analysed for its metallurgical properties. In the *x*-ray film appear darker and lighter shaded areas and it is only by experience that the expert can tell where these darker or lighter shaded areas are located, that is, whether on top, on the bottom or in the centre of the *x*-rayed object. Another factor is important: if a shaded area lies above a lighter area, the two may cancel each other in their effect on the picture so that possibly nothing will be seen in the *x*-ray picture. Neither is it possible to eliminate from the picture any sections of the object which are of no interest at the moment. For instance, when taking an *x*-ray picture of the lung, almost 60 per cent of the picture area is taken up by the ribs and only the parts between the ribs can be recognized with any clarity. If the focus is unfortunately situated in the lung, however, pathologically densified tissues may cover up the cavities (parts of the lung in which the tissue is destroyed) so that neither darker nor lighter shaded areas may be recognizable in the picture.

These shortcomings of the ordinary *x*-ray technique make it very difficult at times to interpret an *x*-ray picture. Several means of overcoming these shortcomings have been attempted in the course of the years.

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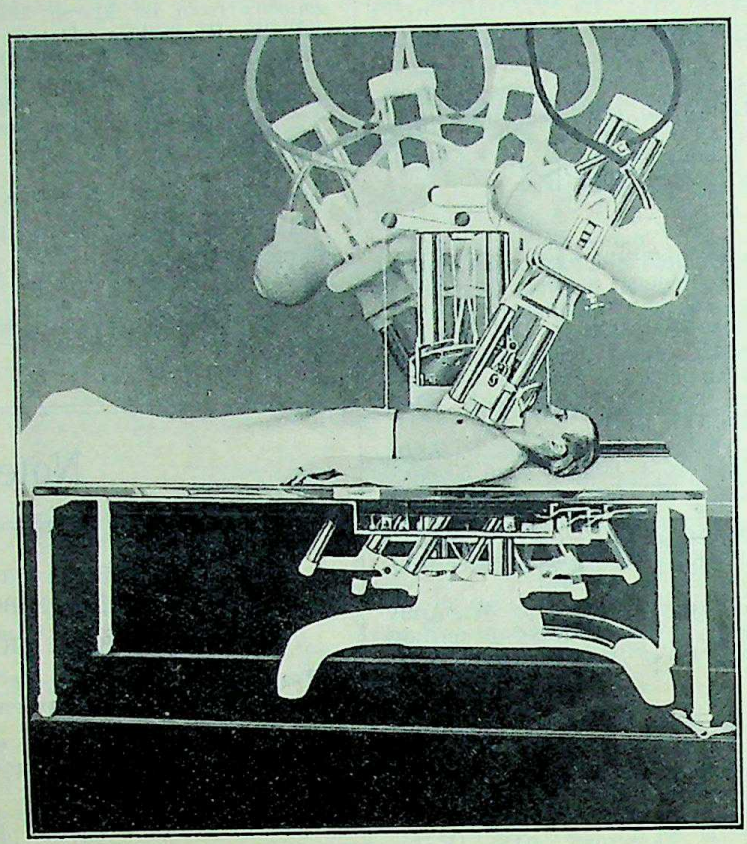
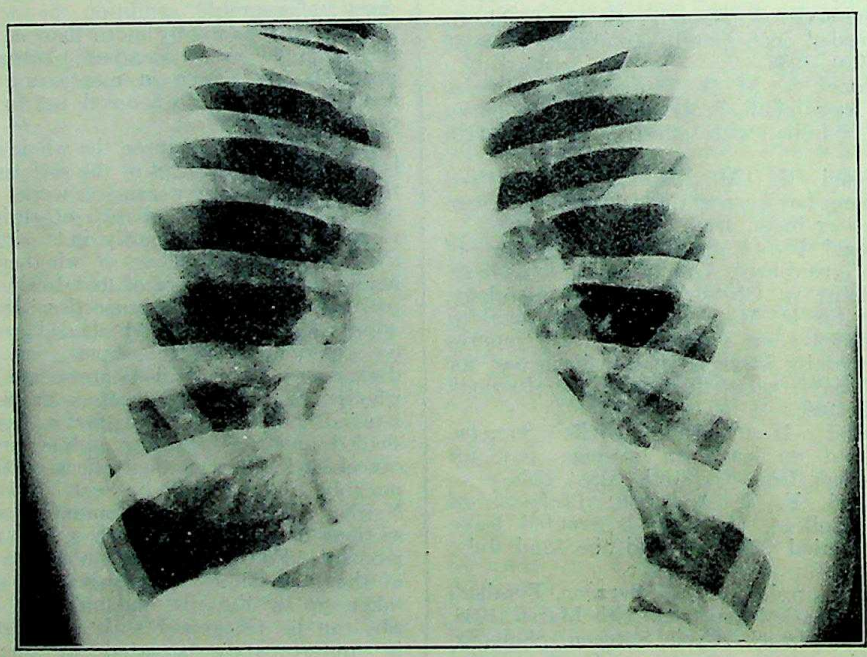
Thus, obliquely taken pictures were tried, although it was found that in this way the *x*-ray picture was distorted too much. Later stereoptical pictures were made by taking two pictures at a short distance from each other and thereby producing a three-dimensional illusion as in the stereoptical photographs. These solutions never proved really satisfactory, however, until recently a method was developed which is based on the previously mentioned fact that in the photographic plate only the fully exposed objects are clearly shown, while all underexposed objects are only vaguely sketched in. When using 'tomography', which is the name given to this type of *x*-ray photography, a certain section of the object to be examined, such as the lungs or the skull, is fully exposed while all that is above or below that section must be underexposed. This



Swinging movement of the tomograph during one exposure.



X-ray picture of a normal lung.

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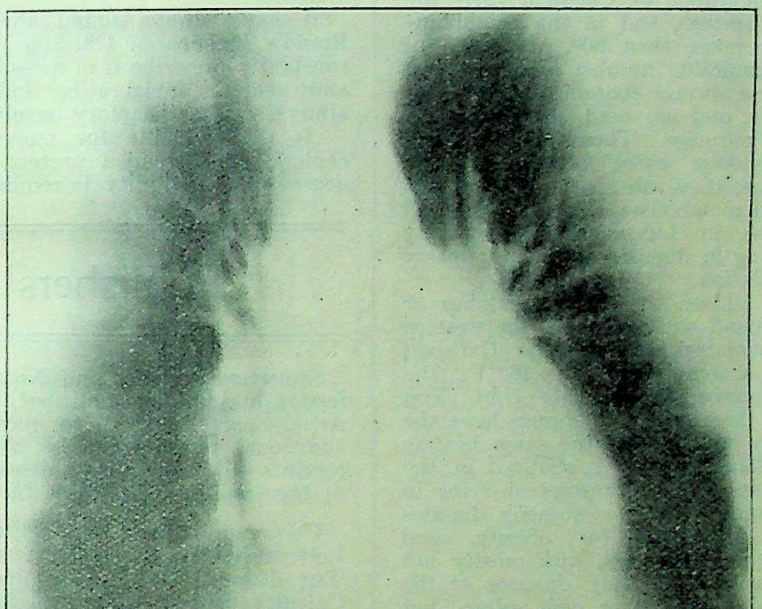
sounds theoretically simple, but has proved practically very difficult and it has taken years before a satisfactorily working 'tomograph' was created.

Professor Dr. Chaoul of the Charite of Berlin and Dr. Grossmann have developed an apparatus for *x*-raying sections or thin layers—for instance, in the lung—without making the parts above or below that section, and especially the ribs which interfere so much with the picture, visible in the *x*-ray. Similarly the experiment recounted before where a person passes in front of a camera and therefore does not become visible in the picture, in tomography, too, the parts of the body which are above or below the section of the body to be examined are moved past the lens; they are only moved theoretically, however, as practically the body, in this case the patient, remains lying quietly on the examination table and only the *x*-ray apparatus is moved.

In the tomograph manufactured by the Electricitäts-gesellschaft 'Sanitas' of Berlin, the *x*-ray tube and the film container are built into a unit in such a fashion that they can be turned round a turning point which lies at the height of the desired body section. While the picture is taken, the *x*-ray focus moves along the arc of a circle from left to right, while the film moves simultaneously from right to left, but remaining always parallel to the table on which the patient is lying, and therefore also parallel to the desired plane of the section through the body of the patient. Through this arrangement it is achieved that every point in the plane of the section always falls on the same point of the film, notwithstanding the constant movement of tube and film during the *x*-ray exposure. All other points in the body, whether they are above or below the plane of the section, are reproduced in the picture at constantly changing points of the film, and are therefore under-exposed and do not show clearly in the picture in which only the plane of the section is clearly shown. By adjusting the turning point of the apparatus to any desired height, certain sections of the body can be *x*-rayed in the heights at which the turning points of the apparatus are set. Generally, three such sectional pictures are sufficient for an examination of the lung. In order to achieve this effect, a certain length of exposure is required, although one second is usually sufficient. The tomograph makes it possible to, so to speak, cut out body sections from a few millimetres to two centimetres thickness from the body for photographic purposes.

The equipment consists of a double armed pendulum revolving around a horizontal axle, with the tube attached to the longer arm on top, and the film carrier to the short arm on the bottom. As the pendulum with the *x*-ray tube swings into motion, the film carrier also moves under the table on which the patient lies, in a plane parallel to the plane of the section. As the pendulum swings from one extreme amplitude through the vertical centre position to the other extreme amplitude, the *x*-ray focus on one side and the film carrier on the other side move along the arc of a circle segment representing approximately one half of a right angle. The whole apparatus is rather simply designed, works absolutely noiselessly and is easy to operate. The swing of the pendulum is released by pushing a button which at the same time turns on the *x*-ray apparatus which is automatically disconnected as soon as the pendulum has reached its other extreme amplitude, that is, after approximately one second. The turning point, representing the height of the plane of the section, can be easily adjusted as the apparatus has a scale showing the height above the table in centimetres.



Tomogram (section photography) of the same lung.
The disturbing shadows of the ribs are eliminated.

Even the layman can imagine the value of such an equipment for medical examination and for the accurate diagnosis of disease. It is always amazing to see an ordinary *x*-ray picture of the thorax with the ribs interfering with the picture, beside a tomographic picture which really shows a section through the lung tissue without a shadow of the ribs or the spine. It is now possible to determine the exact position of disease foci in the lungs, the skull or any other part of the body, without having to speculate on the depth in which such disease foci or foreign bodies such as bullets, etc., are located; the tomograph makes it possible to picture sections through the body in any height in which the disease is suspected to lie. Tomography is an immense advancement over conventional *x*-ray photography which in itself is one of the most important medical implements of the last decades, because tomography gives an entirely new aspect to *x*-ray photography.

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NATURE'S RICH ENDOWMENT OF HEALING WATERS TO CZECHOSLOVAKIA

No other country has been blessed with such a wealth of natural means of healing as the Czechoslovak Republic, whose curative springs were used in ancient times. The group of springs at Karlovy Vary (Carlsbad), Mariànské Làzné (Marienbad), and Frantiskovy Làzné (Franzensbad) is unique. Some of them gush forth at nearly the temperature of boiling water.

Czechoslovakia has a remarkable variety of curative springs. There are not only simple cold springs with chemical or physical substances which cannot be definitely ascertained, but also simple hot springs, *e.g.*, those of Teplice-Sanov, which, although they show no exceptional contents of minerals, have been of service for centuries as an excellent curative means for rheumatism, gout, and nerve diseases. They attain temperatures up to 115°F. It is assumed that the thermal springs are closely connected with the glaciers of the ice period which came as far as the neighbouring Ore Mountains.

The acidulous group is one of the most numerous of the natural mineral waters. It is interesting to note that in the neighbourhood of Carlsbad there are at least 500 acidulous springs, and in the neighbourhood of Marienbad no fewer than 800, of which of course only an insignificant number is used for curative purposes. These springs contain greater quantities of carbon dioxide, and are used either as table water, or for curative purposes. Those at Bílina are most popular for drinking cures, because, as the strongest alkaline springs, they are specially efficacious for maintaining ordered metabolism. There is another group, of which those in Luhacovice are specially known, a spa specializing in diseases of the respiratory organs and blood circulation.

Most interesting of all are the alkaline sulphur or Glauber salt springs, found exclusively on the western spurs of the Ore Mountains. Whereas the Carlsbad springs gush forth at a temperature of 162°F., the Marienbad and Franzensbad springs are cold. You would imagine that, as these groups of springs have the same composition, they would have the same healing effects, but the spas have recently specialized in the curing of certain diseases. Thus Franzensbad, lying in level country, has become a spa for women's diseases and heart troubles, Marienbad for obesity, and Carlsbad, in a beautiful rocky valley, with mostly hot springs, specializes in curing not only diseases of the digestive and intestinal organs, liver, and spleen, but also a number of diseases of metabolism, such as diabetes and gout.

The Teplice basin is very rich in bitter waters, also found in other places. Mention should be made of the well-known Sadskà bitter water, which, like many others of this type, is not drunk on the spot, but is exported in the same way as Saratica and others.

It is only in sodium-chloride springs that our Republic is poor. The most important representative of this group is Darkov Spa, which is effective in curing nervous diseases and scrofula. Sulphur springs are found in great numbers in the country, and the most beautiful and most effective for ailments of the joints and rheumatism are at Trencianské Teplice and Piestany.

It is no wonder that a country so richly endowed also has quite a number of moor deposits. These are in the surroundings of the world-famous spas of West Bohemia, and in the frontier district of North Moravia and Silesia. The freshly-dug mud cannot be used immediately for curative purposes, but must undergo a lengthy disintegrating process, to enable the substances contained in the mud to become effective.

In mountain districts, protected by a girdle of frontier mountains such as the Ore Mountains, Krkonose Mountains, and the Carpathians, which are a natural protection against cold winds from the north, a number of climatic health resorts have developed on the south side of the mountains. These are admirably suited for healing diseases of the organs of respiration and the lungs, and also for the nerves. The most beautiful and highest health resorts are in the High Tatra, where the pure air and mountain sun are highly efficacious. The best known of these resorts are: Strbské Pleso, Stary Smokovec, Novy Smokovec, Tatranskà Lomnica, Tatranskà Polianka, etc.

Frontier nooks, where the mountains protect them from wind and changes in weather, boast of a number of well-managed sanatoria, such as the spas of Grafenberk and Dolni Lipovà; they were the first to introduce water cures.

BRAND'S ESSENCE OF CHICKEN

THE value of this preparation as an invalid food is indicated by the following extracts from letters sent to the makers by medical practitioners of experience.

'I use it frequently for influenza, pneumonia, malaria, typhoid, cholera, etc., and also in cases of gastric illness where an easily digested food is required'.

'As a general tonic and convalescent food which can always be relied upon, there is nothing better, to my knowledge, than Brand's Essence of Chicken. It has the advantage of being very palatable and easily digested'.

'I have always found the quality and purity of Brand's Essence of Chicken to be above reproach. I constantly prescribe it in cases where a natural stimulant and general invigorating influence is required and always with satisfactory results'.

'It is invaluable for pneumonia, malaria, typhoid, cholera, etc., where a protein concentrate with a high degree of digestibility is required'.

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Original Articles

LEPTOSPIROSIS IN INDIA

By B. M. DAS GUPTA

From the Department of Protozoology, School of Tropical Medicine, Calcutta

In a previous communication, Das Gupta and Chopra (1937) reported the occurrence of a case of leptospirosis in Calcutta with recovery of the causal organism (*Leptospira icterohæmorrhagiæ*). Five more cases have since come under our observation. It has been possible to isolate the leptospira from one of these five cases and the diagnosis of the remaining four has been established by agglutination reaction and other tests.

Epidemiology

With regard to the epidemiology of the disease, as it occurs in Calcutta, there is no evidence of contracting the infection by river-bathing or by contact with polluted water. The theory of water-borne infection, especially in sporadic cases, generally accepted in Europe is not, therefore, established in our cases. As all these cases were living in rat-infested houses (there is hardly any rat-free house in Calcutta), the infection might have been acquired by contact with the urine of infected rats. It is a curious fact that the presence of natural leptospiral infection in the rat population of Calcutta has been found to be of rare occurrence. Knowles and Das Gupta (Knowles, 1932) found only two rats infected out of 193. Last year, at the suggestion of Colonel Taylor, a systematic examination of rats was undertaken. The kidneys and liver of each rat were examined by the microscopical and cultural methods. Guinea-pigs were inoculated with the kidney emulsions, one animal being used for inoculation of materials from three or four rats.

The total number of rats (chiefly *Nesokia bengalensis*) examined was 162. No leptospira was found in any of them. Twenty specimens of rats' sera were tested for agglutination reaction with the local human strains, but the results were invariably negative, there being not the slightest evidence of agglutination or lysis, even in a low dilution of 1:10.

The disease in Calcutta is not confined to the individuals engaged in any particular occupation. The first case was a carpenter, the second a water-carrier, the third a cook, the fourth a grocer, the fifth a private servant, and the sixth was a porter.

It has occurred sporadically in different parts of the city. No two cases were seen in the same house nor in the vicinity.

The six cases which have, so far, come under our observation had the following seasonal incidence :—Two cases occurred in August 1937, 2 in December 1937, 1 in January 1938 and 1 in April 1938.

Clinical features

Three cases had a fatal termination and all became delirious before death. Acute onset, severe headache, agonizing pain all over the body, specially in the lumbar region, cramps in the calf muscles, conjunctival congestion, and marked jaundice were constant features. Four cases had bleeding from the gums and one of these also had epistaxis, melæna and patchy hæmorrhages under the skin. There was suppression of urine in two cases. The urine of three patients was examined, this showed evidence of marked renal irritation, albumen, urinary deposits, casts (chiefly hyaline and granular), leucocytes and red blood cells. All the specimens were very highly coloured on account of the presence of bile. One of the patients developed lobar pneumonia but in no other case was there any evidence of respiratory complication. As none of our patients were seen before the sixth day of illness, the degree of pyrexia at the early stage could not be determined. Low-grade fever persisted for two weeks or more in all the three cases that recovered. There was no relapse of the pyrexia in any case. Two fatal cases had a sub-normal temperature before death.

Laboratory notes on individual cases

Case 1

S. K. B. The patient was seen on the 9th day of illness. Blood examinations by microscopical and cultural methods and by inoculation into guinea-pigs were immediately undertaken.

Direct examination of blood.—Several smears were carefully searched under the darkground illumination, and some films were stained by Tribondeau's modification of Fontana's method and examined, but no leptospira could be found in any specimen.

Culture.—(*a*) On glucose broth—sterile.

(*b*) On Fletcher's medium—of the six tubes inoculated with varying amounts of blood from 0.2 c.cm. to 1.5 c.cm. two were found contaminated and the remaining ones gave scanty growth of leptospira from the 13th to the 15th day.

Animal inoculation.—As young guinea-pigs were not available at the time, two fairly large animals, weighing 400 and 442 grammes respectively, were inoculated with 3.5 c.cm. of blood intraperitoneally. The blood of these animals was examined daily from the 3rd to the 28th day of inoculation, far beyond the usual fatal period, with negative results. On the 29th day the peritoneal fluid of the bigger animal showed scanty leptospiræ. Four days later, this guinea-pig was sacrificed. On opening the abdomen no signs of leptospiral infection were apparent. The section of the liver and kidneys, however, showed the presence of leptospiræ. Apparently this animal passed into a 'carrier' condition. Unfortunately, the tissues were prepared only for the detection of leptospiræ by the silver-impregnation method, so that histological changes could not be studied in them.

Urine.—Direct examination of the centrifuged deposits showed a fair number of leptospiræ from the 19th to the 24th day. Two young guinea-pigs, weighing 150 and 162 grammes respectively, were each inoculated intraperitoneally with 2.5 c.cm. of urine collected aseptically on the 19th day. Both the animals died of leptospiral infection.

Protection experiments.—Two guinea-pigs each weighing 150 grammes (approximately) were taken. One was inoculated intraperitoneally with 0.25 c.cm. of the patient's serum taken on the 25th day of the disease

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and the other with the same amount of normal rabbit serum. Next day both the guinea-pigs were given intraperitoneal injections of 0.2 c.cm. of the liver emulsion of a guinea-pig infected with the leptospira recovered from the patient himself. The one receiving the patient's serum previous to inoculation with the infecting organism remained alive and well, and developed immunity against further inoculation with the same strain. But the other animal which had normal rabbit serum succumbed to leptospiral infection on the 6th day of inoculation. As in the preceding experiment two guinea-pigs were inoculated with the patient's serum and normal rabbit's serum, respectively. They were then given injections of 0.2 c.cm. of the liver emulsion of a guinea-pig infected with the strain isolated from case 4. The patient's serum afforded protection against this strain as well, but the control animal (which received normal rabbit's serum) died of leptospiral infection. The above tests were repeated using the patient's serum obtained on the 209th day of illness and the results were exactly the same as before.

Agglutination tests.—

Strains	Patient's serum (collected on the 25th day of illness)	Patient's serum (209th day of illness)
* *L. icterohæmorrhagiæ* (Wijnberg).	1/10,000	1/3,000
* Hond Utrecht IV (canicola)	1/1,000	1/100
* Rachmat ('Indian' strain)	1/1,000	..
* Salinem ('Indian' strain)	0	..
* Swart V. Tienen ('Indian' strain).	0	..
* Andaman strain CH31 ..	0	..
L. icterohæmorrh. (London)	1/3,000	..

* The tests were carried out against these strains by Professor Schüffner and Dr. Sorgdrager.

Case 2

K. B. (fatal). He was seen on the 13th day of illness in a semi-conscious state.

Direct examination of blood.—Microscopical examination of blood by the darkground illumination and by means of stained films was carried out. The results were consistently negative.

Culture.—(*a*) On Fletcher's medium—two tubes remained sterile for a considerable period and the remaining two showed scanty coccoid organisms.

(*b*) On glucose broth (blood was taken half an hour before death)—there was a rich growth of a virulent streptococcus which killed white mice in less than 48 hours, the streptococcus being recovered from the heart blood of the mice.

Animal inoculation.—Two guinea-pigs were inoculated with 3 c.cm. of blood each. None showed any evidence of leptospiral infection, but both these animals became absolutely refractory to the strain of leptospira recovered from case 1, and also the sera of these animals protected guinea-pigs against the above strain but not against the strain isolated from case 4. The guinea-pig used as control was extremely susceptible to the infection.

Examination of post-mortem material.—Fragments of the liver and kidney were available within half an hour of death. No leptospiræ could be demonstrated in the liver or kidney emulsions or in sections stained by Levaditi's method.

Case 3

T. This patient came under our observation on the 10th day of illness.

Direct examination of blood (on the same day)—negative.

Blood culture (10th day).—Two young guinea-pigs, weighing 150 and 155 grammes respectively, were inoculated with the patient's blood. The peritoneal fluid of these animals was systematically examined for a period of three weeks, but no leptospira could ever be detected, nor did the serum of these animals develop any protective antibody, as in the case of the guinea-pigs inoculated with the blood of case 2.

Urine.—During the 3rd week of the disease eight specimens of urine were centrifuged as soon as they were voided and examined both by darkground illumination and by means of films stained by Fontana's method. Five of these samples were also inoculated into guinea-pigs. The results were negative in every case.

Protection experiments.—Patient's serum afforded protection against the strain isolated from case 1, but the guinea-pigs succumbed to the infection following an inoculation with the strain recovered from case 4, although they had been treated with the patient's serum previously. To avoid any experimental flaw these tests were repeated, and the results were identical.

Agglutination tests.—

Strains	Patient's serum (10th day)	Patient's serum (45th day)
* Andaman CH11 ..	1/1,000	1/30
* Moscou V (*L. grippotyph.*)	1/1,000	0
* Wijnberg (*L. ictero.*) ..	1/300	1/3,000
* H. Utrecht IV (*L. canicola*)	1/100	1/10
Andaman CH31 ..	1/100	0
* *L. hebdomadis* ..	1/30	0
* Rachmat	0	0
* Salinem	0	1/30
* Swart V. Tienen ..	0	..
* Hond HC	0	..
* Ballico	0	..
* Pomona	0	..

* Carried out by Dr. Sorgdrager.

Case 4

H. C. B. As the patient was seen during the first week of illness (6th day), particular attention was paid to the discovery of the parasite by direct examination of the blood. Accordingly several smears were prepared and very carefully examined under the darkground illumination. Besides, half a dozen films were stained by Tribondeau's modification of Fontana's method and thoroughly searched for leptospiræ; none could be found.

Blood culture (6th day).—(*a*) On glucose broth—sterile.

(*b*) On Fletcher's medium—the culture was examined every other day from the 7th to the 30th day, when it showed a scanty growth of leptospiræ. As it was not examined on the 29th day, leptospiræ might have been detected on that day also. It is important to note that the organism took an unusually long time to grow.

Animal inoculation (6th day).—Two young guinea-pigs were given intraperitoneal injections of the patient's blood. Both the animals developed typical signs of leptospiral infection and died on the 7th and 8th day respectively, although the liver and kidney emulsion of these animals failed to show leptospira in them.

Urine.—Centrifuged deposits of five specimens of freshly-voided urine obtained between the 15th and 25th day were examined under the darkground illumination with negative results.

Protection experiments.—The patient's serum protected guinea-pigs against the strain isolated from the patient himself, but failed to do so in the case

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of the guinea-pig inoculated with the strain recovered from case 1. As in the previous cases, the tests, repeated a number of times to ensure accuracy, always yielded the same results.

Agglutination tests.—

Strains	Patient's serum (11th day)	Patient's serum (26th day)
* Ballico	1/300	0
* Andaman CH11 ..	1/300	1/100
* Moscou V.	1/300	1/300
L. icterohæmorrh. (classical strain).	1/100	1/10,000
* *L. canicola* (dog strain) ..	1/100	1/3,000
* Rachmat (Human strains from the East Indies.)	0	1/30
* Salinem (Human strains from the East Indies.)	0	1/100
* Swart V. T. (Human strains from the East Indies.)	0	0
* Hond HC (Dog strains from the East Indies.)	0	0
* Hd. 7 (Dog strains from the East Indies.)	0	0
Andaman CH31 ..	0	0
* Pomona (Australia) ..	0	0
* *L. hebdomadis* (Japan) ..	0	0

* Carried out by Dr. Sorgdrager.

Case 5

J. K. R. (fatal). Seen on the 8th day of the disease, died within 4 hours of admission.

Direct examination of the blood—negative.

Blood culture.—(*a*) On glucose broth—sterile.

(*b*) On Fletcher's medium—no growth for five weeks; the tubes were then discarded.

Animal inoculation.—A four-day old guinea-pig was inoculated with 1 c.cm. of the patient's blood. The peritoneal fluid of this animal showed a few leptospiræ 48 hours after inoculation and the guinea-pig died two days later of leptospiral infection.

Post-mortem examination.—As autopsy was not permitted a small fragment of the liver was removed through a small incision in the abdominal wall within three hours of death. Direct examination of the liver emulsion and section of this organ stained by the silver-impregnation method showed no leptospiræ, although marked degeneration of the parenchymal cells and cellular infiltration in the portal areas were seen in sections stained by the iron-hæmotoxylin method.

Case 6

C. J. (fatal). Came under our observation on the 8th day of illness and died on the same day.

Blood smears—negative.

Blood culture—no growth.

Animal inoculation.—Three young guinea-pigs were each inoculated with 1 c.cm. of blood. None of them showed any evidence of leptospiral infection for three weeks, peritoneal fluid being negative throughout.

The serum of these guinea-pigs failed to afford protection against the two local strains.

Post-mortem examination.—Portions of the liver and kidneys were available about 48 hours after death. The sections were found crammed with long filamentous bacilli evidently of post-mortem origin; and no leptospira were found.

Agglutination test.—

	Patient's serum (8th day)	Remarks
* *L. icterohæmorrhagiæ*	0	
* *L. canicola* ..	0	
* *L. hebdomadis* ..	0	
* Rachmat ..	0	
* Salinem ..	0	
De (Calcutta) ..	1/20	As the serum was available only on the 8th day of illness, it was not likely to obtain more definite serological evidence of leptospiral infection.

* Carried out by Dr. Sorgdrager.

Discussion

Very recently Gaines and Johnson (1937) have made an extraordinary observation regarding the detection of leptospira by microscopical examination of blood. They observed :—'In our experience examination of the blood by darkfield examination was the most satisfactory method of diagnosis and gave positive results for all patients. Some had as high as 25 organisms per high power field and in none the search was time-consuming'. These workers also pointed out that '*leptospira persisted in the blood stream months after the onset of illness*' (italics ours).

We carried out direct examination of the blood both under the darkground illumination and by means of stained films using the silver impregnation method. On no occasion did we succeed in detecting the organism, although inoculation of blood into Fletcher's medium at the same time gave positive cultures in two cases.

Fletcher (1927) reported the detection of scanty leptospiræ in the blood films stained by Fontana's method in only 3 out of 32.

Taylor and Goyle (1931) examined the blood of several cases under the darkground illumination, but no spirochætes were ever found. It is difficult to reconcile these observations with the findings of Gaines and Johnson (1937), and one cannot help suspecting that they may have been dealing not with the true organism but with artifacts which arise from the disintegration of red cells and platelets, and may bear a striking resemblance to spirochætes. These peculiar structures were described by Balfour (1911) and also by Knowles and Das Gupta (1924). In spite of the emphasis placed on the nature of these pseudo-organisms, several observers have mistaken them for true spirochætes. Other workers who have studied this disease are inclined to the view that leptospiræ disappear from the blood stream by the end of the first week of illness and on no occasion could they be demonstrated after the 9th day.

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As regards the susceptibility of guinea-pigs to leptospiral infection, Taylor and Goyle (1931) reported that in the Andamans out of 22 guinea-pigs inoculated with the blood of the infectious jaundice cases only one died of leptospiral infection, although positive cultures were obtained from many of the bloods used. Even in this case they were unable to demonstrate the organism in the kidneys and liver, though the animal showed typical signs of leptospiral infection. Later work of these observers, however, shows that they succeeded in infecting young guinea-pigs with the Andaman strains. In our experience guinea-pig inoculation was invariably successful when suitable materials were used. One animal, rather large, weighing 442 grammes, inoculated with a patient's blood obtained on the 9th day of illness, passed into a 'carrier' state. It is not unlikely that some of the guinea-pigs used by Taylor and Goyle for diagnostic inoculations behaved in the same way and that the infection remained undetected, as the peritoneal fluid of the inoculated animals was not examined.

In our series of animal inoculations, one very young guinea-pig just weaned, showed leptospiræ in the peritoneal fluid as early as the 2nd day of inoculation, although the blood of this animal was not positive till two days later. This is an interesting observation in that such an early detection of the causal organism in the guinea-pig (inoculated with the blood of a human case) is, as far as we are aware, recorded for the first time. It has been noted, however, that during a serial passage of the virus through guinea-pigs, the leptospiræ frequently appear in the peritoneal fluid of the 'subpassage' animal inoculated with the infected blood or liver emulsion as early as the 2nd day of inoculation, by whichever route the injection is given.

It will be seen, from the results of the agglutination tests recorded above, that the two strains isolated in Calcutta belong to the same serological type as the classical *L. icterohæmorrhagiæ* strain of Europe and differ from many Eastern strains, including a number of the so-called Indian strains. Strains Rachmat, Salinem, Swart V. Tienen and probably others have been referred to as Indian strains in literature, but to my knowledge this is the first time that a real Indian strain has been isolated and typed. The so-called Indian strains listed above were isolated in the Netherlands Indies and the Dutch workers call them Indian strains. Therefore, in the interest of clarity and in honour of Colonel R. N. Chopra, C.I.E., K.H.P., I.M.S., we should prefer to call the strain first isolated in Calcutta 'Strain Chopra, Calcutta'.

Sera of cases 3 and 4, taken on the 10th and 11th day of the disease respectively, gave an agglutination reaction markedly different from that obtained later during the convalescence. Dr. Walch-Sorgdrager of the Institute of Tropical Hygiene at Amsterdam, who very kindly carried out most of the agglutination tests referred to in this paper, informed me that he had also sometimes noticed pradoxical reaction in his cases, but could not quite explain this anomaly.

If we analyse the results of the protection experiments performed with the sera of 4 convalescents against the two strains isolated from cases 1 and 4, we notice that there are at least three different strains of the causative organism in our series of six cases. For purposes of convenience the results of these tests are shown in the following table :—

Serum collected during convalescence from	Strains recovered from	Results.
Case 1	Case 1	Protection.
„ 1	„ 4	„
„ 3	„ 1	„
„ 3	„ 4	Death.
„ 4	„ 1	„
„ 4	„ 4	Protection.
Serum of the guinea-pig which acquired immunity following inoculation of blood of case 2.	„ 1	„
	„ 4	Death.

It will be seen from the above table that the infecting organism responsible in case 3 is identical with that of case 2. But the strains recovered from cases 1 and 4 are distinct from one another and from case 2 or 3. We may mention here that to ensure accuracy the immunization experiments were carried out many times.

About seven months after recovery the serum of case 1 gave complete protection against the two local strains, but there has been a fall in the agglutination titre.

Erber (1932) reported that wild rats invariably gave positive agglutination reactions in dilutions from 1:50 to 1:2,000. But in Calcutta the sera of 20 rats, including one caught in a patient's house, reacted completely negatively with the two local human strains. The incidence of natural infection with leptospira in wild rats in Calcutta is exceedingly low, as will be seen from the work of Knowles (1928) who found none infected out of 180 rats examined and from that of Knowles and Das Gupta (Knowles, 1932) who recorded the presence of leptospira in 2 out of 193 animals. Besides, in connection with the present investigation 162 rats were very carefully examined, with negative results, although the most recent methods advocated for the detection of leptospira were employed.

The guinea-pigs inoculated with the blood of a patient on the 13th day of illness developed immunity against a local strain (case 2), while those which received inoculations on the 8th and 10th day of illness did not (cases 6 and 3).

The urine of three cases was systematically examined for the presence of leptospira, both by

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direct microscopical examination and animal inoculation, but in one case only could it be demonstrated (case 1). This is in accord with the findings of Taylor and Goyle (1931) who record the presence of leptospiræ in 15 out of 48 cases examined. Kouwenaar (1926), however, was able to detect leptospiræ in the urine of about 77 per cent of his cases.

In none of our fatal cases did we succeed in demonstrating leptospiræ in kidney and liver sections. Our experience of the failure to find post-mortem evidence of the presence of leptospira in the fatal case corresponds with the results obtained by Taylor and Goyle (1931) in the Andamans. It has been noted by some observers that the organism disappears from the liver by the 7th day in human cases and this is probably the reason for our negative findings.

Sanarelli (1928) noticed that experimentally-infected animals frequently showed secondary invasion with other organisms, especially the streptococcus and the paratyphoid bacillus. Moreover, in cases of infectious jaundice in human beings, the latter organism is frequently present in the blood. In order to determine the rôle played by these secondary organisms, he carried out some experiments in collaboration with Dr. Pergher. The results seem to indicate that these secondary organisms in themselves are able to produce the characteristic symptoms, but rarely so severe as to cause death.

We cultured the blood of all our cases, both on Fletcher's medium and on glucose broth; on no occasion was any organism of the paratyphoid group recovered, although the blood culture taken from case 2 half an hour before death gave a rich growth of virulent streptococci.

As noted by Taylor and Goyle (1931) the blood cultures usually take seven to ten days to develop, but in some cases did not show till the 21st day. In one of our positive cultures the growth first appeared as late as the 30th day (case 4).

All our cases showed the characteristic symptoms of the severe type of the disease. It is quite likely that, as in other countries where the disease is prevalent, milder forms with or without jaundice also occur in Calcutta, which are yet to be recognized.

Summary

(1) The occurrence of six cases of leptospiral jaundice in Calcutta during the last eight months is recorded. The identity of the disease was established in every case by laboratory examination.

(2) The causal organism has been isolated from two cases. It belongs to the same serological group as the classical *L. icterohæmorrhagiæ* strain of Europe and differs from many Eastern strains, including two from the Andamans (CH31 and CH11).

(3) Although the infecting organisms recovered from the two cases gave almost identical agglutination reactions, yet they could be differentiated from one another by protection tests.

(4) The disease occurred sporadically in different quarters of the city and is not associated with river-bathing or contact with polluted water, nor has it a predilection for any particular occupation.

(5) The incidence of natural infection with leptospira in the rat population of Calcutta is exceedingly low.

I wish to express my indebtedness to Colonel R. N. Chopra, C.I.E., K.H.P., I.M.S., Director of the Calcutta School of Tropical Medicine, for providing every facility for carrying out this investigation and to Colonel J. Taylor, D.S.O., C.I.E., I.M.S., for many helpful suggestions. To Prof. W. Schüffner and to Dr. Walch-Sorgdrager of the Institute for Tropical Hygiene, Amsterdam, I should like to express my grateful thanks for so generously supplying me with cultures and anti-sera and for carrying out the serological tests, as recorded in this paper. My sincere acknowledgments are also to Major H. C. Brown, C.I.E., I.M.S. (retired), of the Wellcome Bureau of Scientific Research, London, for testing the serum of case 1 for agglutination reaction. I also thank Prof. M. N. De and Dr. D. R. Dhar of the Medical College, Calcutta, for drawing my attention to two cases under their care.

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PEPTIC ULCER IN NORTHERN CIRCARS

A NOTE ON THE INCIDENCE

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THERE was a time when it was thought that gastric ulcers were never encountered in Indians. As late as 1927, quoting Rogers, Rehfuss (1927), an authority on gastric disorders, writes 'Natives of India are almost free from this condition'. But subsequent reports from all over India prove that the above statement is not based on correct information. Hingston (1927) collecting statistics from a few discrete centres in India, such as Madras, Calcutta, Rangoon and Patna, concludes that people from all these areas do suffer from peptic ulcer, though the disease is not very common in certain areas. In fact, he believes, from his experience, that the low figures in certain areas, Bengal for example, are not due so much to the rarity of the disease as to the outlook of the medical practitioners who treat the disease.

Even in India, the disease is reported to be commoner in South India than in the other areas, as evidenced in the following figures from various medical institutions, during the same interval :—

TABLE I

Year	Madras	Calcutta	Rangoon	Lahore
1923	306	25	14	..
1924	328	20	12	..
1925	429	43	16	14
1926	414	67	23	..
TOTAL	1,477	155	65	14

In South India, a group of four districts, the Northern Circars are taken into consideration and the following figures represent the incidence of the disease in the Circars as judged from the records of the Vizagapatam Medical College Hospital, the largest of its kind in the Circars. As the surgical treatment of peptic ulcer is the routine of the hospital, figures are mentioned only in reference to the surgical admissions to the hospital.

During the years 1930–35, there were 3,932 admissions to the first surgeon's wards and 3,929 (corrected figure) to the second surgeon's wards. Of these 7,861 admissions 537 were true cases of peptic ulcer (only cases corroborated on the operation table with or without the positive test meal and barium meal findings); 282 from the first surgeon's wards and 255 from the second surgeon's, *i.e.*, 6.83 per cent of the total admissions were *bona fide* cases of peptic ulcer.

Of these 537 cases of peptic ulcer it is interesting to note that duodenal ulcers are far in excess of gastric ulcers; 466 (86.8 per cent) are duodenal, 35 cases (6.5 per cent) pyloric, and 36 (6.7 per cent) are gastric. In fourteen cases the duodenal and gastric ulcers were associated.

Sex.—The relative sex incidence cannot be taken as representing the true figures, in that admissions to the hospital in the female wards are very few owing to the unwillingness on the part of the women to enter the hospital even in the late stages of the disease. Of the total 537 cases only 33 (6.2 per cent) were females.

The following table represents the relative sex incidence in the peptic ulcers :—

TABLE II

	Total peptic ulcers		Gastric		Duodenal		Pyloric	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Males ..	504	93.8	32	88.9	437	93.8	35	100
Females ..	33	6.2	4	11.1	29	6.2	..	..
TOTAL ..	537	100.0	36	100.0	466	100.0	35	100

Expressed in terms of sex, the relative incidence of gastric ulcer in women is slightly higher than in men, for the proportion of duodenal to gastric ulcers in men is 13.6 : 1, and in women 7.25 : 1.

Age.—The disease is seen to occur at all ages. The age incidence is taken as the age of the patient at admission minus the duration of the disease. A common fallacy in such a calculation is that though the patient is able to say with certainty the duration of the disease, he is not able to give his age correctly; as the agriculturist or the labourer, who is the common victim of the disease, is so ignorant as not to know his age correctly.

The following table represents the average age incidence in males and females respectively :—

TABLE III

	Males (years)	Females (years)
Gastric ulcer ..	30.7	33.5
Duodenal ulcer ..	30.17	32.52
Pyloric ulcer ..	29.78	..

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Occupation.—The vast majority of admissions are in the labouring class of people, whose occupation chiefly is agriculture or manual labour for daily wages. There are very few instances of the disease in the higher class Hindus. Very few are from people other than Hindus, *i.e.*, Christian or Mohammedan.

The classification of all the cases into various occupations is found to be impracticable. Hence to facilitate classification they have been arbitrarily divided into sedentary, active and very active. Under the first have been included occupations such as clerks, landlords, school teachers; under the last have been included all manual labourers working for daily wages and agriculturists. All the others have been included in the second category. The following table represents the incidence when viewed in the light of the above classification :—

TABLE IV

	Duodenal	Gastric	Duodenal and gastric
Sedentary ..	11.93	17.65	12.34
Active ..	19.27	26.46	19.79
Very active ..	68.80	55.89	67.87

Residence.—Of the total 488 cases, where the address has been noted correctly, 56.97 per cent were from Vizagapatam district proper. Of the two neighbouring districts, 14.75 per cent are from Ganjam and 20.08 per cent from East Godavery. Of the remaining, 6.4 per cent of the cases were from the more distant West Godavery; the remaining being stray cases from other districts.

Seasonal variation.—Hutter (1928) pointed out that gastric ulcers occurred during the cold months of the year from December to February, as did recurrences.

The peak of the incidence curve of duodenal ulcer, on the other hand, was reached in May. The incidence was lowest in November.

Autopsy records

Of the 699 post-mortem examinations conducted in this hospital till the end of the year 1935, 90 cases showed gastric or duodenal ulcers in either the acute or chronic stage (12.8 per cent). Of these 54 or 7.7 per cent were chronic peptic ulcers. Of these 2.3 per cent were gastric and 5.4 per cent duodenal.

Some of the individual cases in the series deserve notice. In 17 cases where the cause of death was due to the severe systemic disease such as septicæmia there were found, either in the duodenum or stomach, single or multiple erosions or ulcers. These are termed by some 'agonal'. These agonal erosions may probably be explained by the fact that the stomach has the power of excretion of certain bodies in blood stream (neutral red), and these erosions are caused as a result of the injury to the capillary walls and the mucous membrane during the excretion of the toxin.

In eight cases (15 per cent) death was due to post-operative broncho-pneumonia. This was probably due to the low condition of the patients, who were such bad risks for the major operation of gastrojejunostomy. This brings home the fact that during the routine operative treatment of peptic ulcer the general condition of the patient has to be given prior consideration rather than the enthusiasm of the surgeon for doing such a major operation.

The complication of hæmorrhage in these cases seems to be very rare, as only two cases were encountered during the present series. Two rare instances of duodenal diverticula (Narasimaha Rao, 1938) and two cases of granulomatous ulcers of the stomach have been encountered in the present series. A curious instance of an acute pyloric erosion in a newborn babe among 46 post-mortem examinations held by me on fœtuses during the two years was also encountered.

A separate entity—pyloric ulcer—other than gastric or duodenal ulcer has been included in Tables II and III, but due to the difference in nomenclature and definition, understood by some as an ulcer just at the pylorus corresponding to the pyloric vein (which is considered by Moynihan to be very rare) and considered by others as an ulcer in the pyloric antrum, and by a few as duodenal ulcers extending up to the pylorus, the cases typed as pyloric ulcers have been excluded and only frank cases of gastric and duodenal ulcers are considered.

The relative preponderance of duodenal over gastric ulcers is a well-established fact, but the relative proportion of the two seems to be slightly higher in the present series when compared with others.

In 5,733 operations at Mayo Clinic up to 1920 the proportion of duodenal to gastric ulcer was 4 : 1 (Stewart). Curiously enough the London Hospital surgical statistics as well as those of two London Hospital surgeons, Walton and Souther, show an approximately equal frequency for gastric and duodenal ulcers, but the statistics of most British surgeons agree fairly closely with those of Moynihan ($2\frac{1}{2}$: 1) whilst some give an even higher ratio, Wilkie of Edinburgh 6 : 1 and Young of Glasgow 8 : 1.

It is interesting to note that though the figures in the present series are far higher than those of foreign clinics, they are even lower than figures from other clinics in South India. Madras statistics (Chaudhuri, 1926) show the high figures of 17.1 : 1 and 25.1 : 1 (Skinner, 1932) and Somervell (Bradfield, 1928) from Travancore from a series of 540 cases gives even a higher figure still : 26 cases of duodenal ulcer for every gastric ulcer.

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The following is a summary of the above in a tabulated form :—

TABLE V

	Duodenal ulcers	For every gastric ulcer
Walton and Souther ..	1	1
Moynihan and others ..	2½	1
Mayo Clinic	4	1
Wilkie	6	1
Young	8	1
Vizagapatam Hospital ..	12.0	1
Madras (1925)	17.1	1
,, (1931)	25	1
Travancore	26	1

The relatively greater preponderance of duodenal to gastric ulcers is found in both sexes as evidenced by the following table :—

TABLE VI

Author's name	Males (duodenal to gastric)	Females (duodenal to gastric)
Wilkie	11 to 1	2½ to 1
Young	11 to 1	2 to 1
Present series	13.6 to 1	7.25 to 1

The incidence of the disease in females seems to be higher in other centres in South India than in the present series.

TABLE VII

	Males	Females
Vizagapatam	11.9	1
Madras (Bradfield) ..	24	1
Travancore (Somervell) ..	32.8	1

Occupation

Earlier writers in England were of the opinion that ulcers occurred with special reference to boot-makers and cooks. New Lodge Clinic statistics seem to point out to a special liability amongst the members of the fighting services. Peculiar to this part of the country the disease is found to be common (67.9 per cent) in the poor hard-working labourers and agriculturists. A consideration of one year's consecutive cases shows that out of 40 cases, one was a Brahmin, one Mohammedan, two Kshatriyas, two Vaisyas, and all the others were from other caste Hindus, chiefly the lower labouring classes. Such seems to be the case in Travancore also; as Somervell, comparing the incidence in various castes, comes to the conclusion that 'duodenal ulcer is far rarer in Brahmins and far commoner in Hindu outcastes, relative to the total number of cases'.

But these two findings are not quite in accordance with those of Bradfield (Madras) for, according to him, 'the beggar, the coolie, the rich man, the scholar, and the agriculturists are all numbered amongst its victims', and he proves his case by showing that the proportion of the cases of peptic ulcer in the various communities is proportional of the population communities to the total population in Madras.

Age.—The average age of onset of gastric ulcer in Britain is considerably lower in women than in men, 26 compared with 45 (Stewart). On the other hand, the average age of onset of duodenal ulcer is almost identical in men and women, 38 and 39 respectively. But our figures show that the average age of onset of both the diseases in women is more than in men by about two years. It is also peculiar that the average age of onset in each is roughly the same in both the diseases.

The greater number of cases come from Vizagapatam district, this is to be expected from the hospital being situated at the district centre. Considering the greater distance of the neighbouring districts and the fewer admissions, it cannot be concluded that there is any great disparity in the incidence of the disease in these districts.

Autopsy records

Statistics from various countries show that the disease is relatively more frequent in certain parts of the world; for instance, it is rare in Russia (0.8 per cent) and common in Denmark (16.7 per cent), Germany and England (5 per cent) and North America 6.3 per cent (Rehfuss). Compared with the above the present figure of 12.8 per cent may be considered to be a fairly high figure.

Out of 4,000 consecutive autopsies at the Leeds General Infirmary a chronic ulcer healed or unhealed was found in 9.55 per cent of post mortems. Brinton, Toslin and others say that peptic ulcer is common in as many as 5 per cent of all autopsies, but C. H. Mayo met with only a fraction of 1 per cent, and 7.7 per cent in the present series go to show that the disease is more common than in many other countries.

Comment.—It is curious to note that the disease is so common in the Northern Circars, from the biggest hospital of which the above data have been recorded. It is also peculiar that the disease should be more prevalent in the lower labouring classes than in others. The main features in which the labourer differs from others are (*a*) the unhygienic and insanitary surroundings, (*b*) the poor inadequate diet he is accustomed to, (*c*) the hard manual labour he does for many hours in the day, and (*d*) want of personal hygiene.

The insanitary surroundings and the want of personal hygiene make him more susceptible to disease in general. But his daily diet probably plays a rôle in the chronicity of the ulcer; for, on analysis, the diet is found to be rich in carbohydrate, poor in fats and proteins, and deficient

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particularly in vitamins A and B. The probable factors responsible for the common incidence of the disease in the Circars may be outlined thus:

(i) Bad pyorrhœa alveolaris and constipation are so common in these patients that probably the teeth and gastro-intestinal tract act as septic foci from where elective localization of organisms may occur in the stomach or duodenum.

(ii) The labourers, the commonest victim of the disease, cannot afford to have regular meals and the irregularity in the intervals and the variety of food may predispose to dyspepsia and frequent pylorospasm. The patient frequently gives a history of such a frequent dyspepsia before the onset of the typical symptoms of peptic ulcer.

(iii) The diet of these lower classes is deficient in vitamins A and B, and as McCarrison and others believe such partial avitaminosis probably may give rise to changes in the gastro-intestinal tract which predispose to ulcer formation.

(iv) As Tirumurti and Ramachandra Rao (1936) pointed out, 'there is the possibility of malarial infection (Circars abound in agency tracts where malarial infection is very common) favouring the formation of gastric or duodenal ulcers' in at least some of these cases.

Summary

Statistics from the hospital and post-mortem records of the Vizagapatam Medical College Hospital show that peptic ulcer is a fairly common disease in the Northern Circars.

The probable causes for such common incidence are outlined.

Acknowledgment

I take this opportunity to express my thanks to the Superintendent, King George Hospital, and Professor of Pathology Medical College, Vizagapatam, for access to the records, and to Dr. Kini for the helpful guidance.

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VITAMIN B AND PEPTIC ULCER

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Diet, as a contributory factor in the ætiology of peptic ulcer, was known to the early pathologists. In recent years the subject has been elaborated and various aspects of diet brought to light, and held to be responsible causative agents. Some of them were: 'carried' foods, coarse foods, 'hot' foods, foods at high temperatures, marked difference in the temperature of various dishes; irregular meals, meals at long intervals, etc. That diet probably is partly responsible for the frequency of peptic ulcer in India has been pointed out by McCarrison, Bradfield and Somervell. And the various ways in which the diet was accused were : increased carbohydrate content of the food; markedly low fat diet; gross deficiency of vitamins A, B and C.

Now that laboratory methods have been developed for assaying the various constituents of the food, an investigation into the diet as to its quality and deficiency can be conducted more rationally.

It has been observed by the writer that the diet of the labourer, the common victim of peptic ulcer in South India, is lacking in the essential vitamins A and B, in addition to variations in the proximate principles. The present investigation has been attempted for the purpose of studying the amount of vitamin-B deficiency by microchemical techniques, in patients with peptic ulcer.

Towards the biochemistry of avitaminosis B, contributions have been largely made by the Oxford school of workers. The following may be noted as their essential conclusions. In the brains of experimental polyneuritic pigeons it has been found that there was increased quantity of lactic acid and diminished tissue respiration in glucose or lactate solutions, when compared with healthy controls. It has also been shown beyond doubt that diminished oxygen intake was entirely due to lack of vitamin B in the tissue (Peters, 1936). Hence they concluded that vitamin B was needed for the oxidative removal of lactic acid. Thus the fact was scientifically established that vitamin B was specially concerned with carbohydrate metabolism. Peters and Thompson (1934) have studied the metabolism of pyruvate *in vitro* and came to the conclusion that pyruvic acid, as an intermediary metabolite, was inversely proportional to the vitamin content of the brain. This observation on the brain was applied to other tissues of the body, especially the blood; and it was found that blood has increased intermediate carbohydrate metabolites, especially pyruvic acid which is formed in brain (Thompson and Johnson 1935). Other intermediate carbohydrate metabolites also have been found

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in the blood of avitaminous birds—especially methyl glyoxal—as shown by Geiger and Rosenberg (1933), but this could not be corroborated by Gavrilescu and Peters (1931) and Johnson (1936). Johnson and others (1935) attempted to correlate the above facts for the purpose of assessing the vitamin deficiency of an individual by estimating the pyruvic acid in blood. They established the level in normal patients but could find no person with B deficiency in England for investigation. But in China, Platt and Lu (1935) published their observations of the presence of pyruvic acid in the blood of beriberi patients. Subsequently they (1936) confirmed beyond doubt that the same can be applied as a fairly accurate laboratory test for the avitaminosis B.

Many methods have been advocated for estimating the pyruvate in blood. A qualitative one can be used—a modified Rothera's test with nitroprusside and strong ammonia—a blue-green colour indicates the presence of pyruvic acid. Other tests are those of Simon and Piaux's, and Posternak's quoted by Case. Quantitatively various methods of estimation are available.

1. MacLean's method. Precipitation of pyruvic acid with phenyl hydrazine and subsequent estimation of unchanged hydrazine.
2. Clift and Cook's method (1932) is based on the capacity of binding bisulphite.

Each method has its own advantages and disadvantages according to the medium in which the pyruvic acid is contained; namely, muscle filtrate, blood or cerebrospinal fluid.

The two methods used in the present investigation are modified MacLean's and Cook's. The disadvantage of the first method is in the proper extraction of the hydrazone of the pyruvic acid from the blood, the advantage being that pyruvic acid can be estimated as such. Whereas, in the second method the advantage is the amount of accuracy obtained, with the disadvantage that the pyruvic acid is estimated as an unknown quantity of the bisulphite-binding substances in the blood; the proportions of the remaining variable moieties being also unknown. But with the idea of having a clearer reading of the results by a harmonious combination of both the methods it was attempted to use both the methods together and the attempt was only partly successful.

Pyruvic acid.—The estimations were done by Case's method (1932). Peter's and Thompson's modification (1934) was also tried but was found to be less efficient, due to the following reasons :—

1. Large quantities of ethyl acetate have to be used.
2. The extractions are greater in number and not quite satisfactory and demarcative.
3. Greater time is required.

Case's method involves the following principle :—

Excess of 2 : 4 dinitrophenyl hydrazine is added to the deproteinized extract of the blood (the blood being taken under basal conditions). Pyruvic acid hydrazone along with other hydrazones is formed in the solution and with the uncombined hydrazine are extracted with ethyl acetate. Neutralization of the acids used for deproteinization is done to prevent the subsequent extraction of hydrazones other than that of pyruvic acid. Neutralization of the ethyl acetate extract instead of the preliminary trichloracetic acid extract is done to facilitate rapid instead of repeated extractions with ethyl acetate. The combined hydrazones are evaporated and extracted with toluene, which gives them up more readily than ethyl acetate. The pyruvic acid moiety is extracted from the others in toluene with cold sodium carbonate, which dissolves only the pyruvic acid hydrazone in the cold. The 2 : 4 dinitrophenyl hydrazone of pyruvic acid is extracted from the carbonate after acidification with ethyl acetate and crystallized. The estimate is done by the colorimetric method against a standard 2 : 4 dinitrophenyl hydrazone of pyruvic acid, the solvent being alcoholic potash which gives a deep red colour.

Experimental details.—The patient is not permitted to take any solid or liquid food subsequent to the previous night's dinner. The morning coffee was allowed in some cases. Rest in bed is essential in the morning till the time of taking blood, the idea being to eliminate errors due to intermediate products of carbohydrate metabolism, resulting from exercise; 2.8 to 3 c.cm. of blood are taken and immediately transferred to a weighed centrifuge tube containing 7 c.cm. of 5 per cent trichloracetic acid solution, mixed thoroughly, and the exact amount of blood added then obtained by reweighing. After standing for half an hour the precipitate is separated by centrifuging and extracted twice in the same fashion with 5 c.cm. of 5 per cent trichloracetic acid. The combined extracts are then made up to 25 c.cm. and 5 c.cm. are taken and titrated to pH 2.0 with N.NaOH (N/100 HCl with thymol blue acid range is used as control). The amount of N.NaOH required to adjust to pH 2.0 the remaining 20 c.cm. is added and the volume made up to 25 c.cm. with distilled water. One hundred c.cm. are taken out for estimating the bisulphite-binding substances and 15 c.cm. are allowed to stand 24 hours with 0.1 milligramme 2 : 4 dinitrophenyl hydrazine made up in 1 c.cm. of 2 N.HCl. The whole is now shaken with 20 c.cm. of ethyl acetate in a glass-stoppered 50 c.cm. separating funnel. After separation the aqueous layer, which is nearly colourless, is extracted with a further 10 c.cm. of ethyl acetate. As soon as the aqueous layer is colourless, which is usual after three extractions, it is discarded. The united ethyl acetate extracts now contain all the unchanged 2 : 4 dinotrophenyl hydrazine together with the hydrazones which have been formed. The liquid is also acid owing to the extraction of a certain amount of hydrochloric and trichloracetic acids. These are neutralized by shaking with solid calcium carbonate. The solution is decanted into a glass evaporating basin, washing the calcium carbonate with further ethyl acetate until it is colourless. The washings are added to the main bulk of the fluid. The contents of the dish are evaporated on a water bath to 1 c.cm. and then after removal from the bath 20 c.cm. of toluene are added. The slightly cloudy yellow solution is again transferred to the separating funnel and is thoroughly shaken with 5 c.cm. of cold 25 per cent Na_2CO_3 solution. If pyruvic acid is originally present its hydrazone dissolves in the aqueous layer, colouring it brown. This extraction is repeated with fresh Na_2CO_3 solution until the latter remains

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colourless. Three repetitions usually suffice. The united sodium carbonate layers are now acidified by adding concentrated hydrochloric acid drop by drop. Great care has to be taken in neutralizing, especially in the last stages, for fear of splashing. If the temperature of the flask rises by rapid addition of acid it is advisable to cool the mixture during the process. The 2 : 4 dinitrophenyl hydrazone of pyruvic acid is precipitated and a lemon-yellow suspension results. This is extracted in a separating funnel with successive portions of ethyl acetate until the aqueous layer is colourless. Usually four 10 c.cm. extractions suffice. The ethyl acetate solution now contains all the pyruvic acid hydrazone which is present and it is evaporated to dryness in a glass basin on a water bath. The yellow residue is dissolved when cool in 5 per cent alcoholic potassium hydroxide, giving a deep red solution which is made up with a further known quantity of alcoholic potash to a colour matchable with the standard.

For the purpose of the standard a pure preparation of pyruvic acid 2 : 4 dinitrophenyl hydrazone is made and a stock solution of this is kept in ethyl acetate of such a strength that 1 c.cm. is equivalent to 0.1 mgm. pyruvic acid. A known volume is taken, evaporated to dryness, and dissolved in alcoholic potash just before actual colorimetry. The standard synthetic 2 : 4 dinitrophenyl hydrazine of pyruvic acid prepared in this laboratory gave a melting point of 216°C. (uncorrected value) at 29°C. temperature and 759.6 mm. pressure, the values given by other authors being 216.5° (Platt and Lu, 1936) and 214° (Allen, 1930).

Bisulphite-binding substance values

Principle.—The deproteinized blood extract at pH 2 is taken and excess of bisulphite added. The excess bisulphite is removed with N/10 and N/100 iodine. Then the combined bisulphite is liberated by the addition of Na_3PO_4 and immediately the amount estimated by N/100 iodine. This is the modification of Clift and Cook's method by Elliott *et al.* (1935).

Experimental details.—The remaining 10 c.cm. of the deproteinized blood extract at pH 2 are taken and allowed to stand for 15 minutes with 2 c.cm. saturated $NaH.SO_3$ solution. One c.cm. starch solution is then added and then the uncombined bisulphite oxidized with N/10 iodine solution till the last drop gives a definite

TABLE I

Serial number	Age	Duration in years	Test meal suggestive of	Barium meal suggestive of	Bisulphite binding substances
1	35	5	Not done	....	5.4
2	27	7	Duodenal ulcer with adhesions.	....	9.3
3	30	6/12	Duodenal ulcer	Irregular and defective filling duodenal cap.	8.6
4	30	..	Normal	....	11.14
5	40	3/12	Cicatrizing duodenal ulcer with adhesions.	....	9.9
6	25	?	Hyperacidity	....	10.12
7	38	1½	Duodenal ulcer	Ill-formed and irregular duodenal cap—ulcer duodenum.	47.3 *
8	35	2/12	Could not be done	Irregular and defective filling duodenal cap.	23.73
9	50	3	Hyperacidity	Hour glass contraction stomach	6.039
10	45	6/12	Hyperacidity	....	6.679
11	25	5	Active duodenal ulcer	Irregular and defective filling duodenal cap.	2.711 †
12	35	7	Duodenal ulcer with stenosis.	A 'niche' in the stomach wall.	1.803
13	55	6/12	Active duodenal ulcer	Defective filling duodenal cap with barium sticking at the ulcer area.	2.097
14	30	2	Nil abnormal	Cap not visualized. At operation showed a duodenal ulcer.	3.115
15	35	'Many'	Duodenal ulcer	Marked pyloric stenosis	2.379
16	40	6/12	Not done	....	5.709
17	40	6/12	Not done	....	6.981
18	25	3	Duodenal ulcer with adhesions.	....	5.709
19	30	3	Active duodenal ulcer	Not definite	4.806
20	50	10	Pyloric stenosis	?	2.897
21	35	3/12	Chronic duodenal ulcer	Cicatrizing duodenal ulcer	5.670
22	30	6/12	Active duodenal ulcer	....	5.568
23	50	15	Duodenal ulcer	Cicatrizing ulcer with pyloric stenosis.	6.714
24	25	4	Not done	Well-formed duodenal cap	3.406
25	55	8/12	Not done	....	5.419
26	50	2	Marked pyloric stenosis	Pyloric stenosis	17.72
27	30	4	Hyperacidity	Barium sticking to the ulcer area in duodenum.	8.939
28	40	6/12	Marked duodenal obstruction.	....	2.801
29	25	2	Duodenal ulcer with stenosis.	Duodenal ulcer	2.716
30	28	2/12	Not done	Barium sticking in the duodenum.	11.58

* Done after meals. † Not done under ideal conditions.

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blue colour. The colour of the solution is adjusted to a faint purple, using N/100 Na_2SO_3 solution followed by N/200 iodine solution. Then 2 grammes of $Na_2H.PO_4$—12 H_2O are added and the iodine titration is carried out at once with N/200 iodine made with oxygen-free water. The end point is taken when the standard faint violet persists for 30 seconds. The original method of Clift and Cook required 10 c.cm. of oxygen-free 8 per cent $NaH.CO_3$ solution instead of the phosphate and carrying on the final titration at low temperatures. The bisulphite binding substances are expressed as mgm. Pyruvic acid per 100 grammes fluid (1 c.cm. N/100 iodine—0.44 mgm. pyruvic acid).

Results.—Table I summarizes the findings of bisulphite-binding substances in the blood of patients suffering from gastric or duodenal ulcers the diagnosis being made by history, test meal and barium meal findings. Some of them that were operated upon were verified.

The pyruvic acid as hydrazone is estimated in nearly all the cases but unfortunately values of many of the cases had to be discarded because of the slight difference in the tint for calorimetric estimation which usually crept in on account of two reasons, *viz*, the least delay in calorimetry after the development of the colours and impurities in the ethyl acetate with which the pyruvic acid is extracted.

Table II shows the pyruvic acid values when estimated as pyruvic acid dinitrophenyl hydrazones.

Table II

Serial number	Bisulphite-binding substances	Pyruvic acid	Percentage
1	5.4	1.16	*
2	9.3	1.441	*
3	8.6	6.761	78.67
4	11.14	1.982	17.81
5	9.9	3.685	*
6	10.12	3.118	*
7	47.03	0.117	*
8	23.73	0.619	2.61
9	6.7	5.969	78.48
10	2.7	0.571	*
11	1.8	0.873	48.51
12	2.1	0.417	20.33
13	3.1	2.178	70.26
14	5.99	4.933	82.35
15	6.98	1.253	17.95
16	5.7	0.644	*
17	4.8	2.722	56.71
18	2.9	2.845	99.64
19	5.67	3.798	84.31
20	5.57	5.388	96.72
21	6.67	6.362	94.95

* Indicates a greater percentage of experimental error.

Comment

It is difficult to assess the amount of pyruvic acid present in man during health. The only record that could be found is that of Platt and Lu (1936). They have recorded the readings of 23 healthy Chinese college students whose values varied from 2.22 to 4.82 mgm. bisulphite-binding substances per 100 gm. of blood with an average of 3.27 mgm. An attempt has been made to find the bisulphite-binding substances values in healthy labour classes, as the majority of the 30 cases studied is from the same classes.

Table III

Serial number	Values of bisulphite-binding substances
1	4.7
2	3.1
3	2.7 *
4	5.2 *
5	3.3
6	3.1
7	6.353
8	4.580
9	3.228
10	3.906
11	1.704
12	3.354
13	1.457

* These cases could not be studied under basal conditions.

Thus it is seen that considering the 11 cases done under ideal conditions the bisulphite-binding substances values vary from 1.457 to a maximum of 6.353, the average being 3.457 mgm. Platt and Lu report the content of the blood in established beriberi cases to be markedly increased. But in none of the cases have they reported values higher than 10 mgm. per cent. But in this connection it must be mentioned that some of the 'gastric' cases showed values higher than 10. An attempt has been made to find the corresponding values of beriberi cases admitted to the hospital. Seven cases showing marked avitaminosis B were studied and the values are noted hereunder (table IV).

Table IV

Serial number	Values
1	9.4
2	7.7
3	7.7
4	4.3
5	6.7
6	15.08
7	4.91

It is interesting to note that one of the cases (6) has shown a value of above 15, and others, except case 4, show uniformly high values.

Of the bisulphite-binding substances content of 'peptic ulcer' patients excluding cases 7 and 12, where there was much unavoidable experimental error, the variation is from 2.1 to a maximum of 23.73.

Fixing the maximum in a normal individual as 4.8, as judged from the healthy students, nine of the values are within the normal range and the remaining ones beyond it; so much so that it appears that higher bisulphite-binding substances values are fairly frequent in

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these patients. But this observation is not without possibilities of error, the chief of which is the presumption that the pyruvic acid moiety of the bisulphite-binding substances always bears the same high percentage to the total. But from the readings in Table II it appears it is not quite true. The observations on this aspect are so meagre that the discussion on the subject cannot be complete, but from the proof advanced so far by Platt and Lu (1936) that bisulphite-binding substances values run parallel to the vitamin-B deficiency it may be concluded with a fair amount of certainty that these patients are suffering from partial avitaminosis B. The truth of the statement may be substantiated by the fact that it is in these lower classes that beriberi is fairly common.

The discussion of the subject on the basis of these findings and findings of animal experiments will be given in another paper.

Summary

Bisulphite-binding substances in blood of peptic ulcer patients are found to be increased in a good percentage of cases, showing a definite deficiency of vitamin B in these patients.

Acknowledgments

I take this opportunity of thanking Major J. A. W. Ebden for approving and encouraging me in the work; and of expressing my indebtedness to Dr. V. K. Narayana Menon for his guidance and valuable suggestions; to Dr. D. Narayana Rao for his constant help and interest during the course of the work. My thanks are also due to Dr. P. Kutumbiah and Dr. D. V. Subba Reddi for permitting me to investigate their cases of peripheral neuritis; to Mr. T. S. Ramabhadran for preparing a liberal supply of ethyl acetate; and to Mr. T. V. C. Apparao for assisting in the preparation of standard 2 : 4 dinitrophenyl hydrazone of pyruvic acid.

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TREATMENT OF PHRYNODERMA BY VITAMIN-A CONCENTRATE

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PHRYNODERMA (toad-skin) is the name given to a papulo-follicular dermatosis commonly seen in malnourished individuals (Nicholls, 1933). During recent years considerable attention has been paid by nutrition workers to the study of the condition. A brief review of the literature on the subject and an account of its clinical and anatomical features have been given in a previous communication (Radhakrishna Rao, 1937*a*).

While it is generally agreed that phrynoderma is a separate clinical entity associated with malnutritional states, the exact cause of the condition is still not quite clear. Several workers have described the condition as occurring in association with xerophthalmia and keratomalacia. This finding, together with the results of the histological examination of the papular eruption in phrynoderma, suggested that the condition was probably attributable to a deficiency of vitamin A in the diet. The beneficial results, reported by several workers, of the therapeutic administration of cod-liver oil and, in a few cases, of vitamin-A concentrate on the papular eruption support the above view. Frazier and Hu (1931, 1935 and 1936) have observed that as a result of providing a well-balanced diet and administering 30 c.cm. of cod-liver oil daily, and without any local medication, the papular lesions gradually disappeared, leaving delicate, atrophic, pigmented scars. Loewenthal (1933) also reports the beneficial effects of the administration of cod-liver oil and, in two cases, of 'avoleum'—an extract containing only vitamin A. Reiss (1936) and Youmans (1937) obtained similar results after the administration of cod-liver oil. Goodwin (1934) reported a case in London in which the papular eruption disappeared when the patient was given a good mixed diet with the addition of cod-liver oil. Frazier and Hu (1936) also tried the effect of treatment with carotene (subcutaneously) in one case and halibut-liver oil in another with equally satisfactory results. Nicholls (1935) mentioned that milk or eggs quickly cured phrynoderma and 'sore-mouth'.

This paper reports the results of a clinical investigation of the effect of vitamin-A concentrate on the papular eruption in phrynoderma.

Description of cases and results of treatment

The investigation, of which the present paper forms a part, was commenced in a children's boarding school in the Nilgiris, and later on extended to a day school in the same district. The majority of children attending these schools belong to poorer classes. Children who showed marked evidence of phrynoderma were

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selected for treatment, while mild cases were kept as controls. Treatment consisted in giving vitamin-A concentrate ('preparation A') of the Glaxo Laboratories. Each cubic centimetre of this concentrate, which contains no added vitamin D, contains 72,000 I. U. of vitamin A, or each minim (containing 4,000 I. U. of vitamin A) is equivalent in vitamin A to 2 drachms of standard cod-liver oil. No alteration was made in the diet and no local medication was applied. The control cases received no treatment. The results of treatment over a period ranging from 50 to 140 days were very satisfactory, but they were not definitely conclusive, as the controls also showed slight improvement during the period of observation. It is hoped to undertake further therapeutic tests with vitamin-A concentrate on cases of phrynoderma with a view to confirming the above observations.

In two cases, reported below, marked improvement was noticed in the papular eruption after the administration of vitamin-A concentrate:—

Case 1.—R., a boy, aged about 9 years, was noticed during an examination of the children in a day school for evidence of malnutrition. He was undernourished and under-developed for his age; his general condition was poor and angular stomatitis was present. The skin was dry, and there was a generalized hyperkeratosis of the hair follicles; the papules were very marked, especially on the extensor aspects of the limbs, shoulders and gluteal regions (plate X, figures 1 and 2); scratching of the skin produced a white powdery desquamation. Slight earthy discoloration of the bulbar conjunctiva was present.

The boy was given 2½ minims (10,000 I. U. of vitamin A) of Glaxo Laboratories 'preparation A' every day for 112 days (the boy has had in all 16.2 c.cm. of the vitamin-A concentrate). During the first month of treatment no striking improvement was apparent in the skin condition, but there was rapid improvement after this period, the papules gradually disappearing. When the boy was examined at the end of 112 days, the papules had completely disappeared (plate X, figures 3 and 4), leaving faint scars, the skin was smooth and glossy, and his general condition showed improvement.

Case 2.—The patient, a girl, aged 6 years, showed a well-marked and profuse papular eruption, similar to that seen in case 1 (plate XI, figures 1 and 2). The child had slight angular stomatitis, but no Bitôt's spots or xerophthalmia. Treatment consisted in giving 4½ minims a day of Glaxo Laboratories 'preparation A' for 63 days. During this period the patient has had in all 16 c.cm. of the vitamin-A concentrate. The papular eruption had completely disappeared from the face and body at the end of this period of treatment. With the exception of a few papules, the eruption on the arms had also disappeared. The marked improvement which resulted may be seen from the photographs taken before and after treatment (plate XI).

Discussion

The marked improvement in the papular eruption after the administration of vitamin-A concentrate in both the cases reported above confirms the previous observation that 'the condition is probably a manifestation of a nutritional deficiency in which lack of vitamin A is an important factor' (Radhakrishna Rao, 1937*a*). The results reported here are similar to those of Loewenthal (*loc. cit.*) after the administration of 'avoleum'.

It is generally agreed that the nutrition of the skin suffers in vitamin-A deficiency. The histopathological features of the skin in human keratomalacia were described in a previous paper (Radhakrishna Rao, 1937*b*), and it was pointed out that there is a striking similarity between the microscopic lesions in the skin in keratomalacia and those found in phrynoderma. Moreover, the pathological changes occurring in phrynoderma are similar to the morphological appearances met with in other epithelial structures in avitaminosis A.

The absence of definite clinical signs of xerophthalmia, which is accepted as the visible manifestation of vitamin-A deficiency, in some of the marked cases of phrynoderma is difficult to explain if the latter is ascribed solely to vitamin-A deficiency. It would be interesting to study whether these cases exhibit sub-clinical ocular lesions when the dark-adaptation tests are applied.

While the morphological appearances of the follicular lesions and the results of the therapeutic tests strongly suggest that phrynoderma is due to a nutritional deficiency in which lack of vitamin A is an important factor, further therapeutic tests with vitamin-A concentrates are rendered necessary before the problem of ætiology is finally solved. The beneficial effect of the administration of vitamin-A concentrate on the papular eruption may presumably be also due to the better absorption and utilization of the food consumed. Smith (1932, 1938) and Smith and Sprunt (1935) have presented evidence to show that an atrophy of the sebaceous glands and thinning of the epithelium occur in the tails of albino rats fed on diet deficient in vitamin-B_2 complex. Further study is required to determine the rôle of this factor (vitamin-B_2 complex) in human phrynoderma.

Summary and conclusion

The effect of vitamin-A concentrate (Glaxo Laboratories 'preparation A') on the papular eruption in phrynoderma was studied in two advanced cases. In both instances, the follicular lesions had disappeared after the administration of about 16.0 c.cm. of the concentrate.

The result of the therapeutic tests confirms the previous observation that phrynoderma is probably a manifestation of a nutritional deficiency in which lack of vitamin A is an important factor.

Acknowledgment

Acknowledgment is due to Dr. S. Dorai Raj for the clinical notes of case 2.

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PLATE X—*Case* 1

Before treatment.

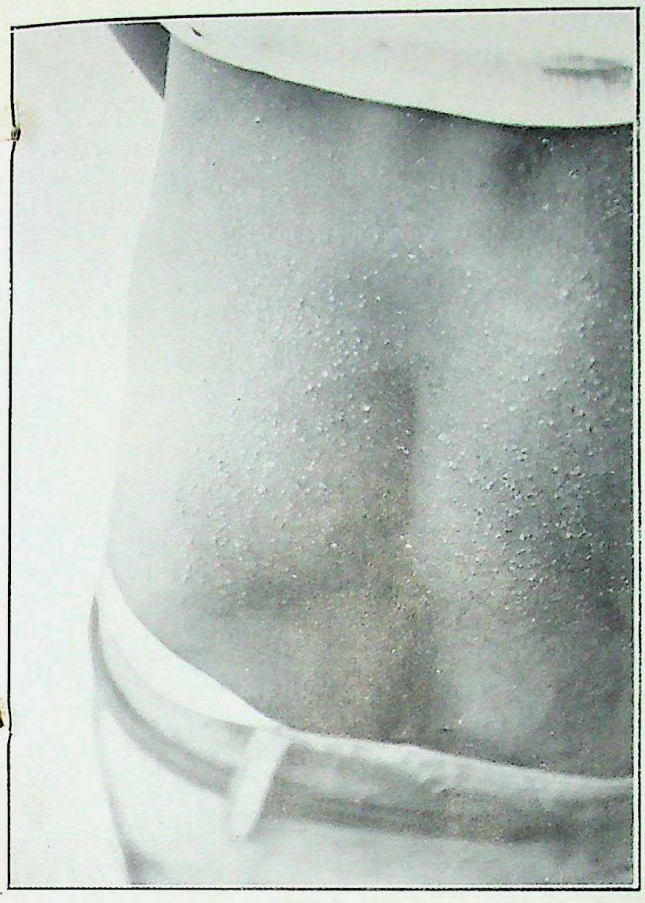

Fig. 1.

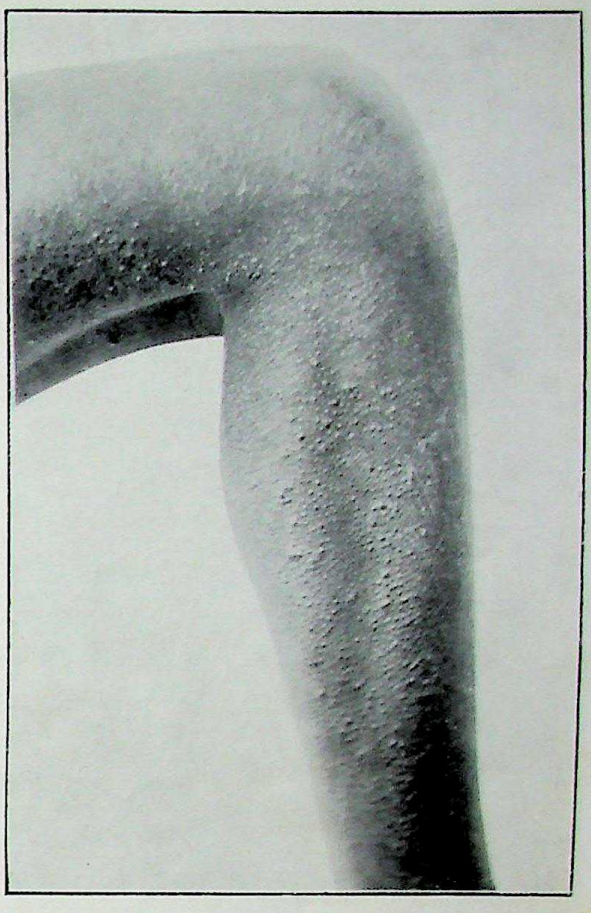

Fig. 2.

After treatment with vitamin-A concentrate.

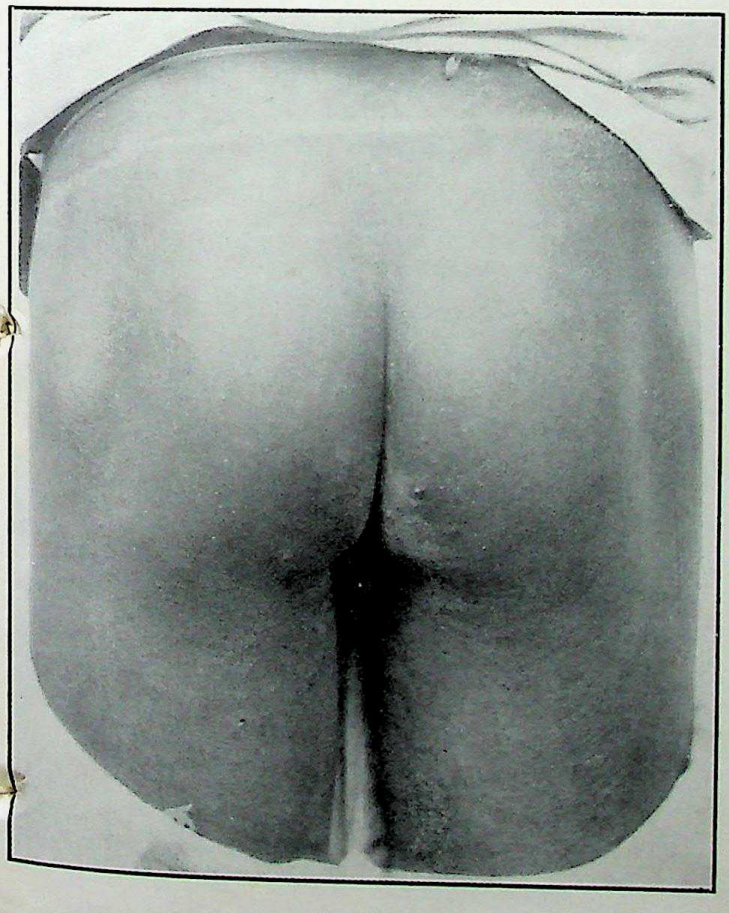

Fig. 3.

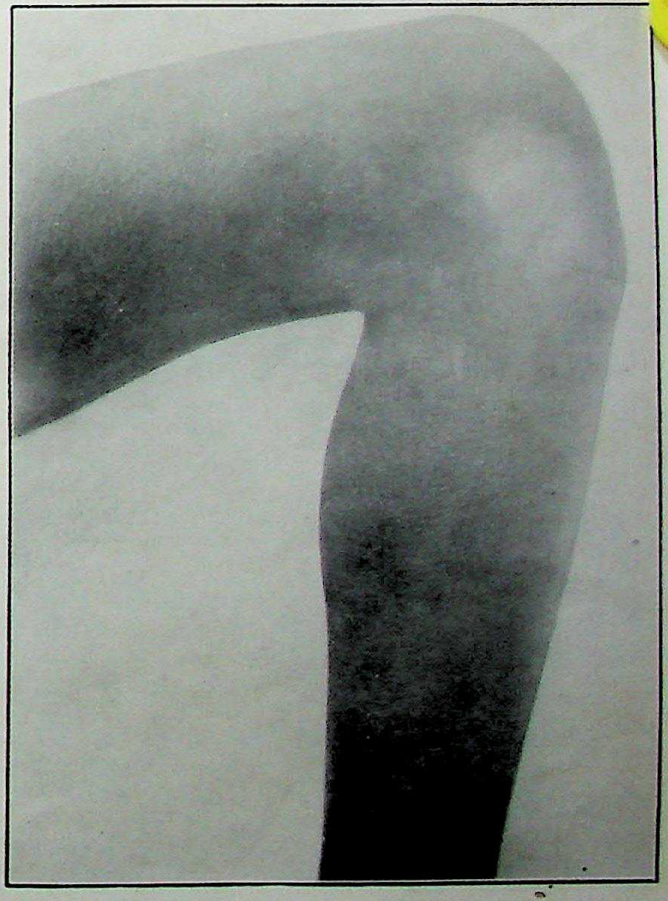

Fig. 4.

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PLATE XI—*Case 2*

Before treatment.

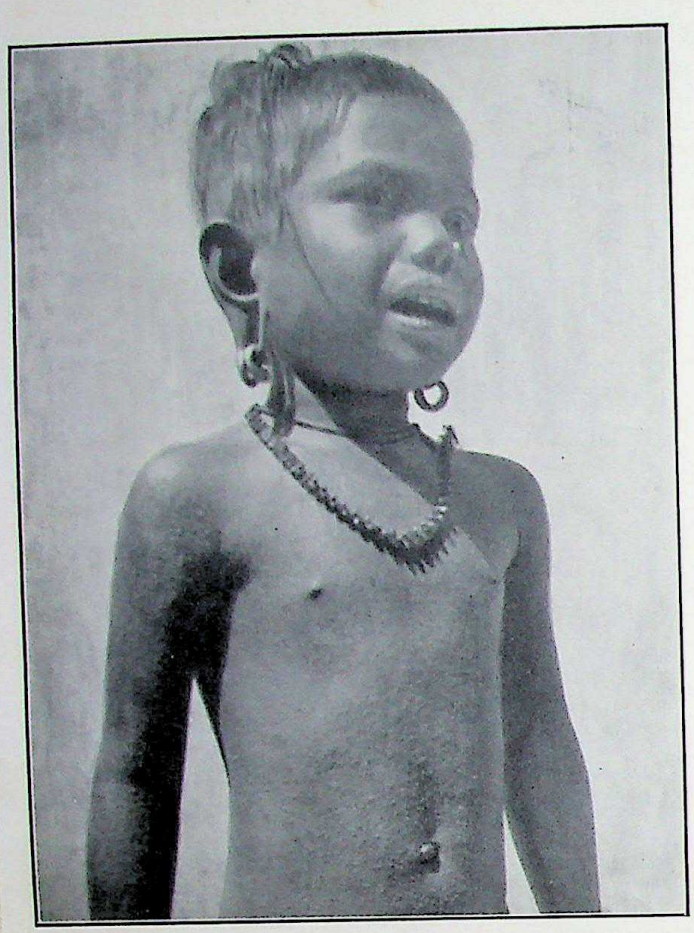

Fig. 1.

Fig. 2.

After treatment with vitamin-A concentrate.

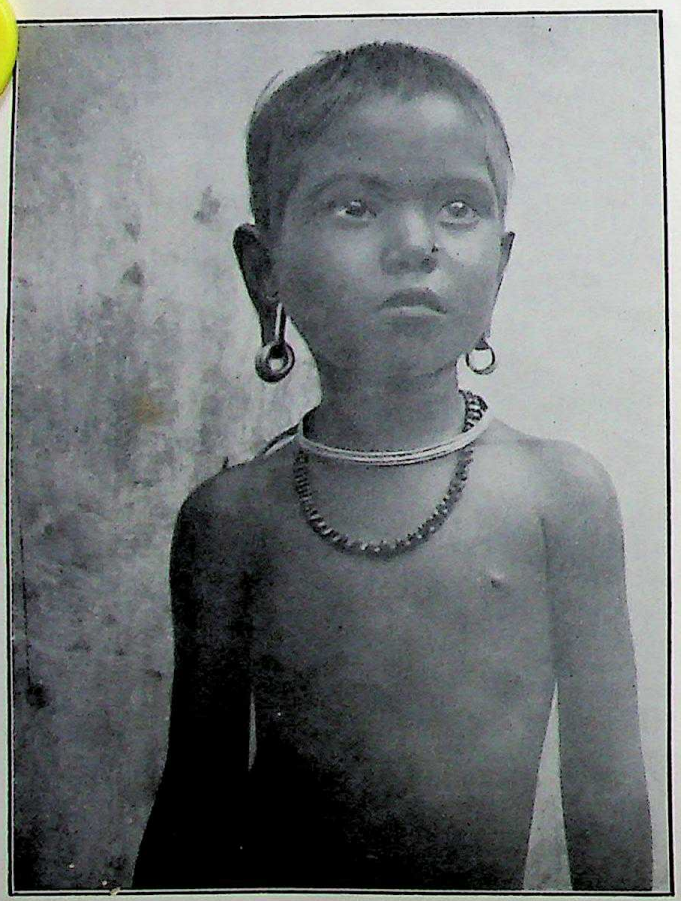

Fig. 3.

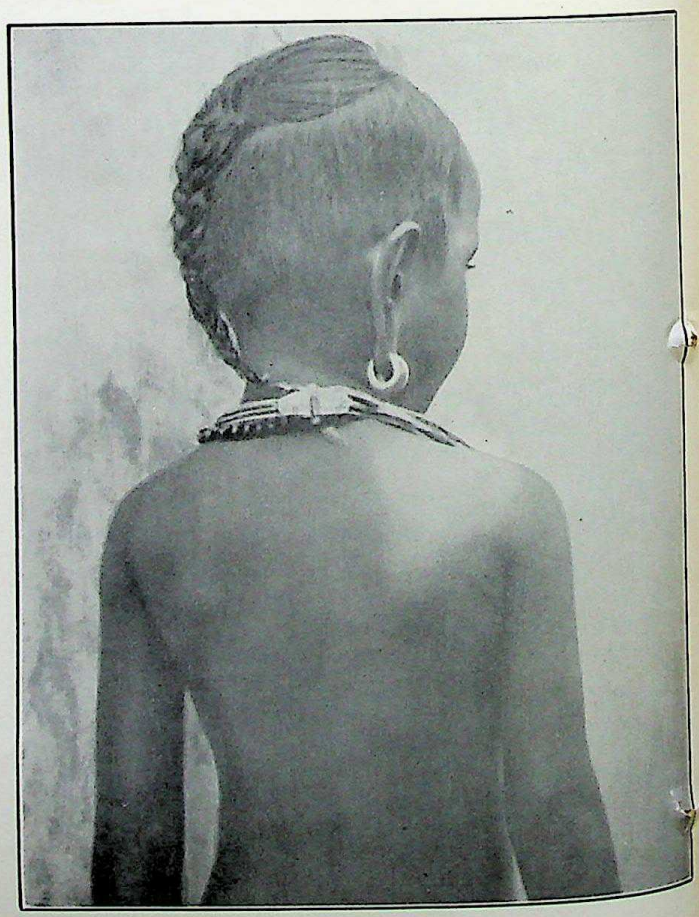

Fig. 4.

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STUDIES ON THE POTENCY OF PROPHYLACTIC VACCINES

1. CHOLERA VACCINE

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CHOLERA vaccine is extensively used for prophylaxis, particularly during epidemics of cholera and in endemic areas of the disease. There are three main sources of cholera vaccine, the vaccines prepared by certain recognized laboratories, the vaccines prepared by local commercial firms and a certain amount of vaccines imported from abroad. The recorded observations on cholera vaccines such as those of Taylor, Ahuja and Singh (1936) deal with the keeping properties of vaccine and the relative value of strains of vibrios in the preparation of cholera vaccines. The present paper records the results of the examination of fourteen samples of vaccines representing cholera vaccines from the three sources mentioned above.

The methods employed in the examination of the vaccines are summarized below :—

(1) *The test for the sterility of the vaccine.*—Each vaccine was examined for the presence of viable ærobic and anærobic bacteria. The test was carried out in fluid medium, and in order to ensure that the phenolic content of the final dilution shall be less than 0.01 per cent, 0.4 c.cm. of the vaccine was added to 30 c.cm. of nutrient broth of pH 7.6. In the case of the test for anærobic bacteria, cooked meat was added to the nutrient broth to occupy a depth of about one inch at the bottom of the tube and before inoculation the medium was heated to 100°C. for half an hour to expel dissolved oxygen, and then cooled to 37°C. The tubes after the addition of vaccine were placed in McIntosh and Filde's anærobic jar in an atmosphere of hydrogen. Both the ærobic and anærobic tubes were kept under observation for 14 days. In addition, smears were examined from each vaccine. Gram-positive contaminating organisms were not seen in any of the samples.

(2) *The test for the freedom from abnormal toxicity in the vaccine.*—For this two tests were employed :

(*a*) For excess of phenol, 0.5 c.cm. of the vaccine was injected subcutaneously into an adult white mouse and the animal kept under observation for seven days. Freedom from any serious symptoms was taken to signify absence from excess of phenol or other preservative in the vaccine.

(*b*) For the presence of any abnormal toxins, 5 c.cm. of the vaccine was injected intraperitoneally into guinea-pigs of about 300 grammes in weight and the animals kept under observation for seven days. Freedom from any serious symptoms was taken to signify absence of any abnormal toxins in the vaccine.

(3) *The examination of antigenic response in rabbits.*—Two rabbits were injected intravenously with each vaccine. The amount of vaccine injected into each rabbit was one half of the total human dose recommended by the manufacturer and was injected in a series of three graded doses at intervals of five days. The serum of each animal was examined for the presence of cholera agglutinins before the inoculation of vaccine and again 10 days after the last dose. The results recorded are the average of the findings in the two animals.

(4) *The antigenic response in man.*—One full prophylactic dose as recommended by the manufacturer of each vaccine was given to human volunteers in two subcutaneous injections. A sample of blood was collected before the injection of vaccine and again 14 days after the second injection. Only those individuals in whom there were no cholera agglutinins in 1 in 10 dilution of the serum were selected for the inoculation of the cholera vaccine.

(*Continued from previous page*)

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(5) *The protective value of vaccine.*—This was tested by immunizing five guinea-pigs with the test vaccine, followed 10 days later by the injection of 2 M. L. D. of a toxic strain of recently isolated *V. choleræ* of the Inaba type. The immunizing dose used for each guinea-pig was half the adult human dose and this amount was injected intraperitoneally. Control series of animals showed a 100 per cent mortality after the injection of the test dose of cholera vibrio.

A second series of guinea-pigs were immunized with the cholera vaccines and 10 days later injected intracutaneously with 0.1 c.cm. of a live culture of *V. choleræ* known to give rise to a marked skin reaction. The skin reactions which consisted of a well-marked induration and flush were read after 12 hours. In the control uninoculated guinea-pigs, the skin reaction was apparent after 12 hours and consisted of an indurated flushed area about 3–5 cm. in diameter which gradually faded and disappeared in 48 hours.

Fourteen cholera vaccines from different sources were examined. Six of these were prepared in recognized laboratories and eight were commercial products. The results are given below in tabular form.

TABLE I

The vaccines tested, the number of vibrios per c.cm. as stated on the label, the adult dose and the number of months before date of expiry at time of test

Serial number.	Number of vibrios in millions per c.cm. as stated on the label	Adult human dose recommended by the manufacturer in c.cm.	Number of months before date of expiry at time of test
1	8,000	1.5	12
2	8,000	1.5	7
3	8,000	1.5	5
4	8,000	1.5	No information.
5	8,000	1.5	12
6	8,000	1.5	12
7	2,000	1.5	24
8	5,000	1.5	20
9	No information	1.5	No information.
10	No information	1.5	No information.
11	5,000	1.0	10
12	5,000	1.0	18
13	5,000	1.5	12
14	2,000	3.5	18

It will be seen that there is considerable variation (from 2,000 to 8,000 million vibrios per c.cm) in the strength of the different vaccines, and further that there is no general agreement as to the length of time a vaccine is to be considered to have retained its activity. The preparations of certain recognized laboratories are allowed six months to one year, whereas many of the commercial firms allow a year or more. As the majority of the commercial preparations only give the expiration date it is not possible to know the length of time allowed for each product. At the time of the test, vaccines nos. 12 and 14 were claimed to be potent for 18 months. In the majority of the preparations no instructions were given as regards the method of storage.

All the vaccines passed the sterility test and were free from any abnormal toxicity. The results of the tests for the antigenic response, the protection experiments and the skin reactions are summarized in table II.

It will be seen that with the first six preparations, which are the products of certain recognized laboratories, the agglutinin response in rabbits and in man and the protection test gave satisfactory results. Of the eight samples of commercial vaccines tested, four (nos. 7, 8, 9 and 14) showed the development of agglutinins and possessed protective properties and four vaccines gave uniformly negative results. So striking was the difference with the two groups of vaccines that the tests were repeated with the samples of commercial vaccines, using fresh series of animals. The results obtained were similar. It may be noted that the various preparations were given serial numbers and it was not possible to identify the products of any company whilst the various tests were in progress. The analysis was made after all the tests were completed.

The skin reactions were absent or only a trace of reaction occurred in guinea-pigs immunized with the vaccines possessing satisfactory agglutinogenic and protective properties. There was a well-marked skin reaction in animals immunized with vaccines, which did not produce cholera agglutinins in rabbits and possessed no protective value for guinea-pigs. The results of this test corroborate the other findings.

Six vaccines were tested for direct agglutination with standard cholera 'O' and cholera 'H' and 'O' sera and cross agglutination with sera prepared with each vaccine. Three of these vaccines (nos. 3, 5 and 6) were the products of recognized laboratories and three were commercial preparations. Of the latter, one was known to give rise to cholera agglutinins and two (nos. 9 and 10) gave no cholera agglutinins. The results, summarized in table III, show that the comparatively simple test of direct agglutination gives valuable information as to the antigenic structure of the organism used in the preparation of the vaccine.

Summary

1. The results of the examination of fourteen cholera vaccines are recorded. The vaccines were tested for sterility, freedom from abnormal toxicity, antigenic response in rabbits and man and protective value in guinea-pigs.

2. All the vaccines passed the test for sterility and were free from abnormal toxicity.

3. All the six cholera vaccines prepared by recognized laboratories gave satisfactory antigenic response and protected guinea-pigs against 2 M. L. D. of *V. choleræ*.

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TABLE II

The agglutinin response in rabbits and in man, the protection test in guinea-pigs and the skin reaction in guinea-pigs

Serial number of vaccine	Agglutinin response in rabbits		Agglutinin response in man	Protection test			Skin reaction after injection of cholera vibrio in vaccinated guinea-pigs
	Cholera 'O' antigen	Cholera 'H' and 'O' antigen	Cholera 'H' and 'O' antigen	Number of guinea-pigs vaccinated	Number of guinea-pigs surviving	Percentage survival	
1	800	3,200	400	5	4	80	Not done.
2	1,600	5,000	800	5	5	100	Not done.
3	3,200	5,000	400	5	5	100	Nil.
4	400	1,600	1,600	5	5	100	Trace reaction.
5	2,000	3,200	800	5	5	100	Nil.
6	1,600	3,200	400	5	4	80	Nil.
7	800	1,600	800	5	4	80	Nil.
8	400	1,600	800	5	4	80	Nil.
9	400	1,600	400	5	3	60	2 × 2 cm.
10	Nil	200	Nil	5	1	20	5 × 3 cm.
11	Nil	Nil	Nil	5	Nil	Nil	2 × 1 cm.
12	Nil	Nil	Nil	5	Nil	Nil	5 × 3 cm.
13	Nil	Nil	Nil	5	1	20	2 × 1 cm.
14	400	1,600	Not done	5	5	100	Nil.

TABLE III

Showing the results of agglutination of six vaccines with standard cholera 'O' and 'H' and 'O' sera and the results of cross-agglutination with sera prepared with the individual vaccines

Suspension	Serum prepared with							
	Formalized Inaba strain	Dried Inaba 'O' antigen	Vaccine no. 3	Vaccine no. 5	Vaccine no. 6	Vaccine no. 9	Vaccine no. 10	Vaccine no. 11
Vaccine no. 3	3,000	500	5,000	1,500	3,000	1,500	Nil	Nil
Vaccine no. 5	3,000	1,000	3,000	3,000	3,000	1,500	Nil	Nil
Vaccine no. 6	3,000	1,000	3,000	1,500	4,000	1,500	Nil	Nil
Vaccine no. 9	1,000	125	1,500	1,500	1,500	500	Nil	Nil
Vaccine no. 10	Nil	Nil	Nil	Nil	Nil	Nil	5,000	Nil
Vaccine no. 11	Nil	Nil	Nil	Nil	Nil	Nil	Nil	6,000
Inaba 'O'	2,000	2,500	1,500	2,000	1,500	125	Nil	Nil
Inaba 'H' and 'O'.	3,000	2,000	2,500	3,000	3,000	1,500	200	Nil

4. Four of the eight commercial preparations of cholera vaccines produced cholera agglutinins and possessed protective properties and four vaccines gave uniformly negative results. It is suggested that the cultures used in the preparation of these vaccines were not tested for identity by the generally accepted tests applicable to *V. cholerae*.

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SPONTANEOUS SUBARACHNOID HÆMORRHAGE

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THE spontaneous form of subarachnoid hæmorrhage has come much into prominence lately and is now recognized as a definite clinical entity. The most important cause is rupture or slow leakage of an aneurism on one of the arteries at the base of the brain, especially in the circle of Willis; a favourite position being the junction of the anterior communicating artery with the anterior cerebral. Such an aneurism is believed to be congenital, due to inherent weakness of the walls of the arteries. It has been shown that at the angle of bifurcation or junction of two vessels on the circle, the inner muscular coat is frequently absent and an aneurism develops at the weak point. It is usually found in young people in whom there is no evidence of syphilis or atheroma. There may be several aneurisms at different points in the basal arterial system. They are of small size, and at times they are so small as to escape superficial inspection. From their resemblance to a sprig of mistletoe, they are described as 'berry aneurisms'.

Less commonly and in older people, subarachnoid hæmorrhage may be caused by the rupture of a degenerate artery with or without the preliminary formation of a small aneurism. Aneurism of the cerebral artery may also result from embolism in infective endocarditis and cause hæmorrhage.

It is well to bear this pathological condition in mind in all puzzling cases of lesions in the central nervous system, especially those which do not seem to fit in with any other pathological state.

Clinical features

Cerebral aneurisms of the type described above may cause no disability until they rupture, although in a few cases recurring headaches, pressure signs due to implication of some cranial nerves, have been noted. It is the rupture or a small leakage that causes the symptoms and the signs, and their severity depends on the situation of the rupture and on the degree of leakage. The victim usually a young adult complains of sudden and severe pain in the back of the head and the neck, a sensation as if something had burst in the head. There may be history of overwork or fatigue preceding the onset. The headache increases in severity and this is followed by lethargy, stiffness and tenderness of the neck, head retraction, nausea and vomiting. Gradually consciousness becomes impaired though not necessarily lost. The patient becomes irritable, and complains of his head. At other times there may be delirium, convulsions and periods of coma. Kernig's sign is generally present. The clinical picture is therefore one of meningeal irritation of acute onset and the diagnosis is made by lumbar puncture, which yields a uniformly and often heavily blood-stained cerebrospinal fluid under pressure. If the corpuscles are allowed to settle, the supernatant fluid is seen to be yellow. The effusion of blood may extend forward through the optic foramen along the sheath of the optic nerves and cause subhyaloid hæmorrhages. There may also be transient albuminuria and glycosuria.

In favourable cases the bleeding stops, the headache and the irritability gradually abate, the patient may pass into sleep and later wakes up with consciousness restored. The leakage from the small aneurisms may induce thrombosis within and around the sac, and it has been observed at necropsy that such an aneurism can clot and fibrose. This explains survival from the initial hæmorrhage, but if there is repetition within a few days or weeks, as is not uncommon, then the prognosis becomes definitely graver. A patient may have recurring attacks of unconsciousness at long intervals, due to small leaks. The only abnormality that may be found in such chronic cases is the yellow coloration of the cerebrospinal fluid (xanthochromia) due to long antecedent hæmorrhage.

In unfavourable cases the symptoms which are due to frank rupture of the aneurism are like those of severe cerebral hæmorrhage. The patient passes into deep coma and succumbs. Lumbar puncture yields copious, almost pure, blood.

Case report.—A. H., a Bengali Mohammedan, aged 18 years, a book-binder by occupation, was admitted into the Carmichael Hospital for Tropical Diseases on the 9th August, 1937, with a history of irregular fever, breathlessness on exertion, swelling of the legs and diarrhœa of one year's duration. He also complained of recurrent attacks of headache.

There was nothing of importance in the previous history except that he had kala-azar in 1928 and hookworm infection in 1935 for both of which he was treated in this hospital.

He was pale and anæmic with œdema of both legs. The liver was slightly enlarged. The spleen was not palpable. There was a hæmic murmur in the heart. He had slight daily rise of temperature and the pulse was rather rapid. After a few days' stay in the hospital he complained that he had been passing an excessive amount of urine for some time. The urine was therefore measured regularly from 15th August to 13th September; the daily output varied from 40 to 108 ounces. The urine examination showed specific gravity 1015, reaction acid, albumin a trace, urobilin a trace, no sugar, a few pus cells, no tube casts. The blood pressure was 105/70 mm. of mercury. The eyes were normal.

Blood counts (done by Dr. Sen Gupta) showed hæmoglobin 2.6 gm., red cells 1,370,000 per c.mm., MCV 78.03 cu.μ, MCH 19.05 $\gamma\gamma$, MCHC 24.9 per cent. Total nucleated cells were 4,600 per c.mm., polymorphonuclears 3,013 (65.5 per cent), lymphocytes 782 (17 per cent), large mononuclears 161 (3.5 per cent), eosinophils 506 (11 per cent), basophils 92 (2 per cent), and normoblasts 46 (1 per cent). The reticulocyte count was 1.4 per cent.

The van den Bergh test was negative. The Wassermann reaction, aldehyde and antimony tests were negative. The gastric analysis showed hypochlorhydria. The Mantoux test was negative (1 in 100,000 dilution).

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In view of the microcytic hypochromic anæmia the patient was given a course of ferrous sulphate, 18 grains a day, from the 14th August to 3rd September. There was steady improvement of the blood as well as in his general condition. The hæmoglobin improved from 2.61 to 12.1 gm. and the red cells from 1.37 to 4.92 millions. On the 14th he had epistaxis due to an acute local inflammatory condition, which was checked by argyrol spray.

On 1st October, the patient complained of severe headache. He was given a dose of saline purgative and a few doses of aspirin but to no effect. The urine was examined again, it showed marked reaction for albumin, but no casts were found. The fundus oculi was healthy. The headache persisted for the next two days in spite of sedatives and large doses of alkalis. On the 4th the pulse was slow (62 per minute) and the blood pressure 152/80 mm. of mercury. The temperature was normal. The patient was obviously suffering from a great deal of pain in the head. The neck was stiff and the head was retracted to a certain extent. The patient resented interference. The cranial nerves were normal. Pupils were equal and reacted to light and accommodation. There was no papillœdema nor intraocular hæmorrhage. Consciousness was clear, and he talked normally. There was no sign of paralysis of the limbs nor loss of sensation. The knee and ankle jerks were slightly exaggerated on both sides. Kernig's sign was positive. Babinski's sign was positive on both sides. The superficial abdominal reflexes were present but rather sluggish. There was no vomiting. The urine was diminished in quantity. Other organs of the body appeared healthy.

On lumbar puncture the cerebrospinal fluid flowed with increased pressure. It was intimately mixed with blood and appeared to be of similar density in the two successive specimens. Ten cubic centimetres of the fluid were withdrawn. The patient was immediately relieved of pain to a considerable extent. The cerebrospinal fluid was allowed to settle in the refrigerator and it was found that the blood cells had fallen to the bottom of the test tube, while the supernatant fluid was yellow. This finding along with the clinical picture led to the diagnosis of spontaneous subarachnoid hæmorrhage of meningeal type. The Wassermann reaction of the fluid was negative and the culture was sterile. The urea and non-protein nitrogen content of blood was normal.

Next day headache increased and the neck was stiff, as before. The pupils were dilated, but were equal and reacted normally. The temperature went up to 101.8°F., pulse 64 and respiration 24 per minute. Lumbar puncture was done again with considerable relief of pain. The same had to be repeated on the following day also. The character of the fluid was about the same each time. The patient was given daily injections of intravenous glucose and hexamine. Ice bags were constantly applied over the head and neck and sedatives given as required.

The symptoms gradually subsided. On the 10th the patient was practically free from pain and rigidity of the neck. The urine was free from albumin. The blood pressure came down (110/70 mm. of mercury). On the 14th he had no headache or fever, but he was found to have homonymous hemianopia of the right half of the visual fluid. This finding was subsequently corroborated by Dr. Refatullah of the Eye Hospital. The fundus oculi was healthy. A skiagram of the skull was taken; this did not show any abnormality in the region of the pituitary fossa. One remarkable feature observed was the disappearance of polyuria previously complained of, after the attack.

The patient was kept in the hospital for a further period of about three months. Except the hemianopia and occasional slight headache he had no complaints. He was given a second course of ferrous sulphate for three weeks which raised the hæmoglobin to 14.2 gm. and red cells to 5.11 millions. General health improved further, and there was a gain of 13.5 lb. in weight altogether.

Discussion

Diagnosis of cerebrospinal fever was obviously excluded in this case. Albuminuria and the raised blood pressure with a previous history of polyuria led to the suspicion of uræmia, but they were only of short duration, and the urea and non-protein nitrogen content of the blood were normal. Encephalopathy, due to the massive doses of iron given to this patient, was also considered, but the character of the cerebrospinal fluid was against it, and the second course of ferrous sulphate was uneventful. Pituitary tumour was another possibility, and the polyuria was very suggestive. There was, however, no sign of dyspituitarism and there was no radiological evidence of any change in the sella turcica.

In a young person with healthy arteries and negative Wassermann reaction the cause of hæmorrhage giving rise to a meningeal syndrome was presumably rupture of a congenital aneurism. The bloody cerebrospinal fluid was not due to the accidental puncture of a vessel for three reasons :—

(1) It was intimately mixed with the fluid and all the specimens after each lumbar puncture presented the same appearance.

(2) The blood did not clot.

(3) When the fluid was kept in a refrigerator and the red cells allowed to settle the supernatant fluid was xanthochromic.

The aneurism was apparently pressing on the pituitary body giving rise to polyuria previous to its rupture. The homonymous hemianopia was an interesting sequel in this case, which was evidently caused by an organized blood clot pressing on the left optic tract.

Temporary marked albuminuria was perhaps of the same significance as glycosuria in brain injury.

Repeated lumbar puncture, though not advocated by some authorities, owing to the apprehension of provoking fresh leakage from a healing rent, was definitely beneficial in this case. Drainage did not have any tendency to increase the bleeding.

Acknowledgment

My thanks are due to Dr. L. E. Napier, under whom the patient was treated, for his permission to publish this record and to Dr. P. C. Sen Gupta who did repeated blood counts.

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ILLUSTRATIONS EXPLAINING AN ARTICLE ON '*SIPHUNCULINA FUNICOLA* (EYE-FLY)'

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Published in the January 1938 number of the *Indian Medical Gazette*, p. 17

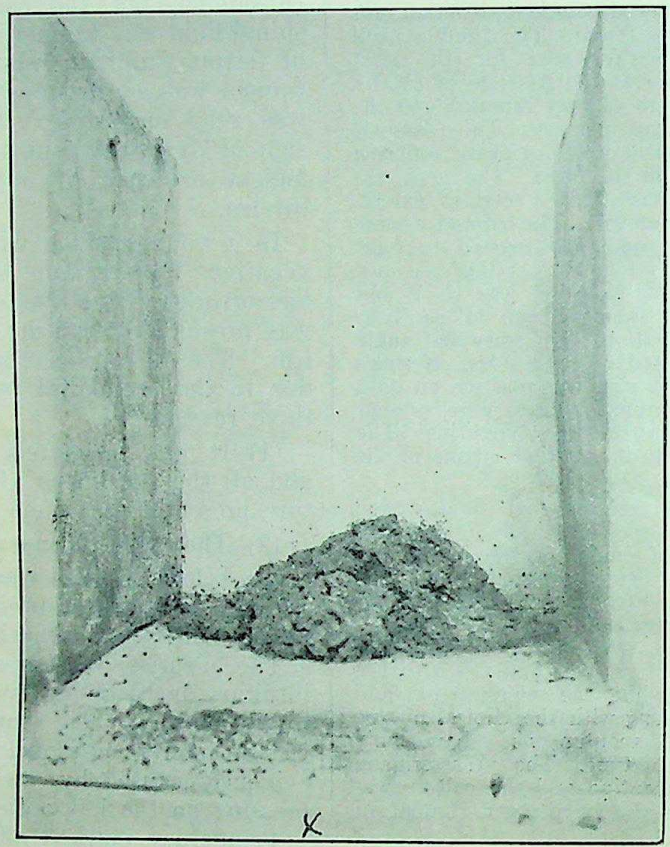

Fig. 1.

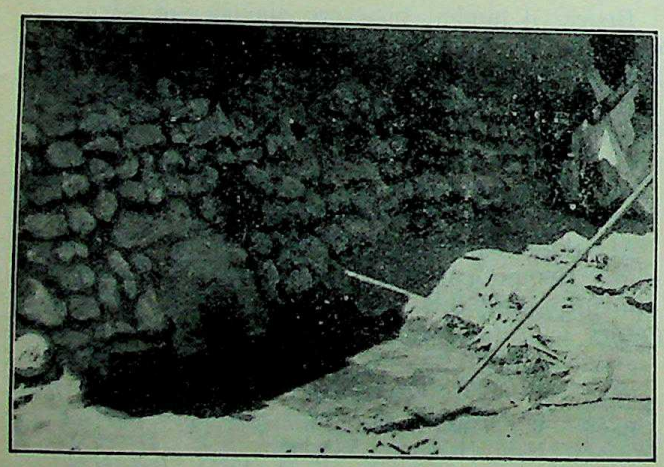

Fig. 2.

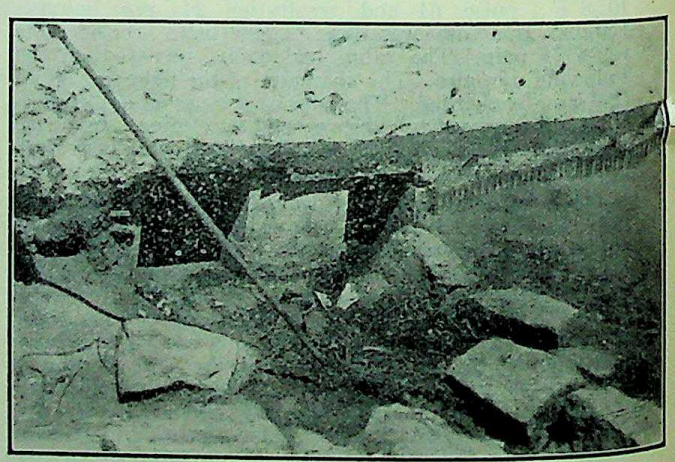

Fig. 3.

Figure 1.—Photograph taken at Lahore in February 1938 in a latrine. Note the fæcal matter between the foot rests. Eye-flies can be seen on the fæcal matter and on the walls around.

Many flies were seen clustered on cobwebs hanging from the ceilings.

Larvæ and pupæ were abundantly seen in a mass of fæcal and urinous matter mixed up in mud just in front of the seat, shown by a cross in the picture.

Figure 2.—Contents of a latrine collected in a pit outside the house. There is some decomposing mud mixed up with fæcal matter just beyond the pit (indicated by stick). The place was breeding eye-flies heavily. Photograph taken in Hyderabad in May 1938.

(*Continued at foot of opposite page*)

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THE EFFECT ON RATS OF SUPPLEMENTING A NORTH INDIAN DIET WITH VEGETABLE PROTEINS (SPROUTING PULSES) AND CALCIUM

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and

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WILSON and his associates (1936) in discussing the results of a diet survey in Calcutta remark that the protein element in nutrition in India may ultimately prove to be the most important, and it will certainly be the most difficult to remedy. Aykroyd and Krishnan (1937), on the other hand, showed that inclusion of skimmed milk powder, calcium lactate and yeast greatly enhanced growth and improved the general condition of rats fed on a poor south Indian diet and addition of proteins such as casein or an amino acid such as cystine had but only slight effect in improving the nutrition of the rats on the same basal diet, and they are of opinion that the above idea of Wilson *et al.* may be erroneous. We (Pal and Singh, 1938) corroborated the latter workers' results, namely, that addition of calcium enhances the nutritive value of Indian diets based on rice, as assessed by the growth of groups of young rats, and this effect is slightly increased if phosphorus is also added at the same time.

Up till now very few practical suggestions have been made for improving the nutritive value of the poor north Indian diet by addition of cheap supplements. The inclusion of animal proteins, fish or meat, is not always possible as in many cases it is avoided on religious grounds and even though there may not be any religious prejudice, the poor cannot afford to take it, just as they cannot afford the luxury of a liberal supply of milk or milk products in their diet. Under these circumstances it is a difficult problem how to improve the poor north Indian diet without much increase in the cost. So with a view to investigating the effects on rats, of the addition of an extra quantity of pulses (in a sprouting condition) as a source of vegetable protein and calcium lactate, both individually and together, to the poor north Indian diet, and to find out whether the protein element (Wilson *et al., loc. cit.*) or the calcium (Aykroyd and Krishnan, *loc. cit.*) acts as a better supplement to the typical poor north Indian diet, this present work was taken up.

Experimental

Four groups of half a dozen young rats of an average weight of 54.5 gm. were given the following diet, corresponding roughly to the daily diet of an adult of the poorer classes in north India, mixed and fed in the proportions indicated below.

Whole wheat flour (*Triticum vulgare*)	8 oz.
Raw polished rice (*Oryza sativa*) ..	8 „
Black gram (*Phaseolus mungo*) ..	2 „
Dhal Arhar (*Cajanus indicus*) ..	2 „
Amaranth leaves (*Amaranthus ganjeticus*)	2 „
Brinjal (*Solanum melongena*) ..	2 „
Onions (*Allium sepa*) ..	1 „
Chillies (*Capsicum annum*) ..	2 gms.
Coriander (*Coriandrum sativum*) ..	2 „
Mustard oil	1 oz.

Group I was given the basal diet alone. Group II had the basal diet with the addition of a quarter ounce of sprouted gram. Group III was given the basal diet supplemented by 0.88 gm. calcium lactate, or 0.15 gm. for each rat. Group IV received the basal diet together with both the supplements in similar quantities.

The experiment lasted for eight weeks during which the weight of the animals was recorded once every week. The following table and the chart show the average rate of increase in the four groups of animals under experiment for eight weeks.

(*Continued from opposite page*)

Figure 3.—Showing two more outlets of a latrine. The stick is pointing the place where eye-flies were breeding quite heavily. Photograph taken in Hyderabad in May 1938.

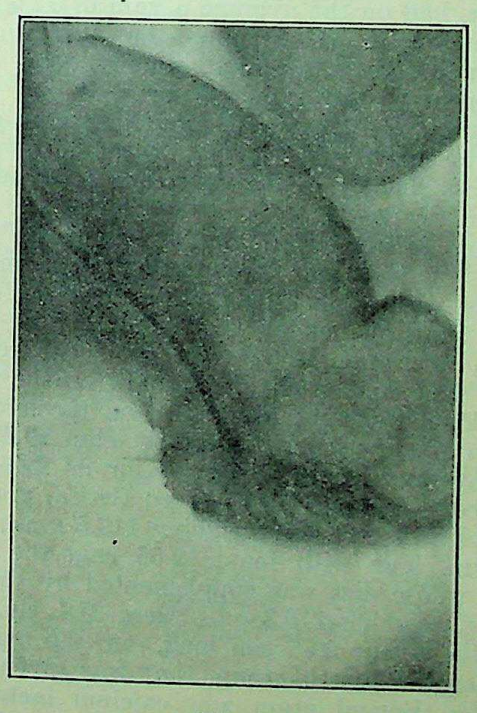

Fig. 4.

Figure 4.—An enlarged photograph of the proboscis of the eye-fly. Note, this grows on the sucking surface.

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TABLE I

Average increase in weight in grammes in eight weeks

Group	Initial weight	1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	8th week
I	54.5	59.7	66.7	74.5	79.3	87.8	93 8	97.8	102.1
II	54.5	63.5	70.5	83.2	90.0	99.7	107.7	112.7	119.5
III	54.5	62.8	73.3	83.5	86.7	97.0	106.0	112.0	115.3
IV	54.5	61.7	74.0	89.0	94.7	107.7	117.0	120.7	126.1

At the end of the experimental period the length of the animals was measured (from the mouth to the end of the tail), and after the

CHART

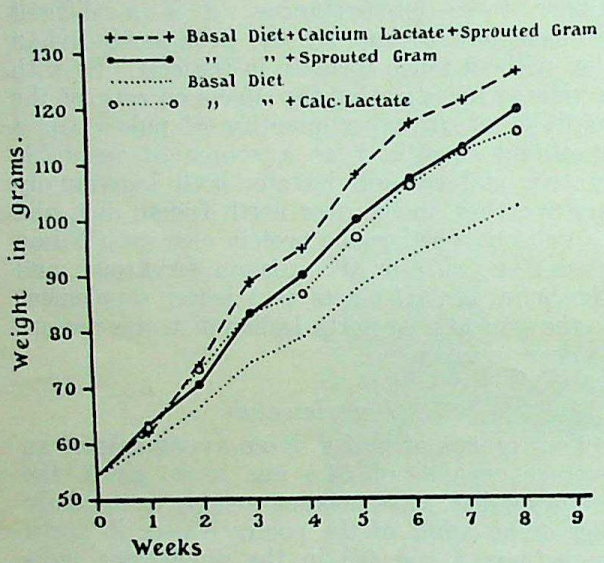

Chart showing the average rate of increase in weight of the four groups of experimental animals for eight weeks.

animals were killed by drowning, one femur of each animal was taken out, thoroughly cleaned and its length was measured with a pair of callipers. Table II shows the average final

TABLE II

Average length of the animals (from mouth to tail) and average length of the femur in the four groups

Group	Average length of the animal	Average length of the femur
I	29.25 cm.	2.46 cm.
II	30.1 ,,	2.56 ,,
III	31.1 ,,	2.65 ,,
IV	32.0 ,,	2.76 ,,

length of the animals and that of the femur for comparison.

Discussion

In another paper, we (Pal and Prasad, 1938) have suggested that increase in weight may not always be a completely satisfactory criterion of better growth and nutrition so we took the length of the skeleton and that of individual bones as well, to study developmental differences in the different groups of animals. In this experiment too, we took into consideration, the increase in weight, and also the difference in the length of the animals as well as their individual bones (*e.g.*, femur) of all the animals, for the comparative study of the growth and nutrition. A perusal of table I shows that the first group of animals on basal diet had on the average an increase of 57.6 gms. in eight weeks, the second group that was given a quarter ounce of sprouted Bengal gram in addition to the basal diet, had a gain of 65 gms., the third group having 0.88 gms. of calcium lactate as supplement to the basal diet, showed an increase of 60.8 gms., and the fourth group having a combination of both as supplements to the diet, had on the average a gain of 72.6 gms. in eight weeks. This shows that 0.15 gm. of calcium lactate was almost equally good, as a supplement to the ordinary north Indian diet, as addition of 1|24 oz. of sprouted Bengal gram daily, for each rat; whereas a combination of both acts slightly better than each individually, as a supplement.

A comparison of table I, showing the final weight of the four groups of experimental animals, with table II, giving the average length of the skeleton and of the femur of the four groups of animals, shows some interesting facts. The first group of animals, on the basal diet alone, weighing 102.1 gms. on the average, had an average length of the skeleton 29.25 cm. with average length of the femur as 2.46 cm., the second group, with sprouted Bengal gram as a supplementary diet, weighing 119.5 gms., were 30.1 cm. long with femur 2.56 cm., the third group whose diet was supplemented by calcium lactate weighing 115.3 gms. were 31.1 cm. long with the femur 2.65 cm. long, on the average, whereas the fourth group, that was given both sprouted Bengal gram and calcium lactate in similar quantities in addition to the basal diet, weighed 126.1 gms., having an average body length of 32.0 cm. with 2.76 cm. as the average length of the femur. All these data make it easy to say that the ordinary diet of the poor people of

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northern India, is deficient in proteins as well as in calcium, which when added to the diet act as good supplements in promoting better growth and nutrition. When sprouted gram is added alone, the development of the muscles is more, while when only calcium is added, the skeletal development is more, but when both are added to the diet there is a more or less harmonius development of both the skeleton and the muscles, promoting better growth and development, as shown by the maximum increase in weight and also in length of the skeleton, amongst the four groups of experimental animals. Freudenberg and György (Stewart and Percival, 1928) think that when both proteins and calcium are present in food in sufficient quantities proteins form a compound with calcium by virtue of its acidic groups, that the resulting compound having a preponderence of basic groups combines with phosphate ions, and that the calcium-protein-phosphate complex so formed breaks down with deposition of calcium phosphate and liberation of original protein which then probably becomes available for other tissues such as muscles. That is probably the reason why a combination of proteins and calcium acts as a better supplement to the ordinary north Indian diet, than each added separately. Such a diet comes very near in composition to the diet no. 11 consisting of atta chapatties smeared with butter, fresh raw cabbage, raw carrots, sprouted Bengal gram and fresh cow's milk, with small quantities of meat twice a week, advocated as the best of all different types of cheap well-balanced diets for Indian people, by Aykroyd and Krishnan (1936).

Summary

Addition of sprouted Bengal gram and calcium, separately or together, enhances the nutritive value of a poor north Indian diet. The increase in weight on a supplement of sprouted Bengal gram is mostly due to development and growth of muscles, whereas calcium as a supplement, promotes better growth and development of the bones and the skeleton, which are mostly responsible for the increase in weight. A combination of both as a supplement, produces an algebraic sum of the effects due to each and as such acts better than either of them individually.

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VOLVULUS AS A CAUSE OF INTESTINAL OBSTRUCTION

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VOLVULUS of the small and large intestine is one of the many causes of intestinal obstruction in India. Reports of this condition in English journals are rare. In the literature on this subject it is said, however, that volvulus as a cause of intestinal obstruction is more common in some parts of Russia, and eastern Europe, as it is in India.

There were eight cases of volvulus admitted and treated from 1932–1936, six of them were in the pelvic colon and two in the small intestine. Three of the six cases of volvulus of the pelvic colon were admitted for acute intestinal obstruction, two were admitted for pyloric obstruction and had remarkably long meso-sigmoids (one of the anatomical types conducive to the formation of volvulus as described by Leichtenstern, Keinboc, Lardennois and Aubourg) and the remaining one was admitted for chronic colic, worse at night with occasional signs of intestinal obstruction for a short period, relieved by subsequent passage of a large amount of flatus. The two cases of volvulus in the small intestine were associated with the congenital abnormality of imperfect fixation of the mesentery. The volvulus in these cases was found along the mesenteric axis formed by the superior mesenteric vessels.

The following are the notes of the cases admitted :—

Acute cases of intestinal obstruction due to volvulus of the pelvic colon

(1) A male aged 40 years was admitted for acute intestinal obstruction with absolute constipation and vomiting lasting eight days. A 'ladder pattern' was seen extending from the left iliac fossa right up to the epigastrium. His general condition and pulse at the time of admission were very poor and he was moribund. Post mortem showed a volvulus of the pelvic colon which had become gangrenous.

(2) A male aged 40 years was admitted with a history of constipation and inability to pass fæces and flatus of three days' duration. Vomiting had started 24 hours before admission. On admission the general condition and pulse rate were found to be good. Under spinal anæsthesia the abdomen was opened by a left paramedian incision. On opening the abdomen a volvulus of the pelvic colon with enormous distension of the loop, which had undergone one complete clock-wise turn, was found. Excision of the pelvic colon, with end to end anastomosis, was done after undoing the twist. The patient was discharged cured.

(3) A male aged 50 years was admitted with a history of constipation of three days' duration and distension of abdomen but no vomiting. Ladder pattern was distinctly visible, more on the left side, extending from the left iliac fossa to the epigastrium. General condition and pulse were satisfactory. Under spinal anæsthesia, the abdomen was opened by a left paramedian para-umbilical incision. A volvulus of the enormously distended pelvic colon, twisted one and a

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half turns clockwise, was found. Excision of the pelvic colon with end to end anastomosis was done. Patient was discharged cured.

Chronic case of intestinal obstruction due to volvulus of the pelvic colon

(4) A male aged 60 years was admitted for recurring attacks of pain and constipation lasting for a short period, usually relieved later by passage of large quantities of flatus. Pain generally started at the left of the umbilicus and was accompanied by a lot of discomfort and difficulty in breathing. After admission definite symptoms of obstruction were noticed in the early hours one morning with a tumour-like mass extending from the left iliac fossa to the umbilical region. The abdomen was opened under spinal anæsthesia by a left paramedian para-umbilical incision. A markedly omega-shaped pelvic colon was found, with adhesions at the convexity at its antimesenteric border to the posterior abdominal wall, below the duodeno-jejunal flexure, with one complete turn of the lower

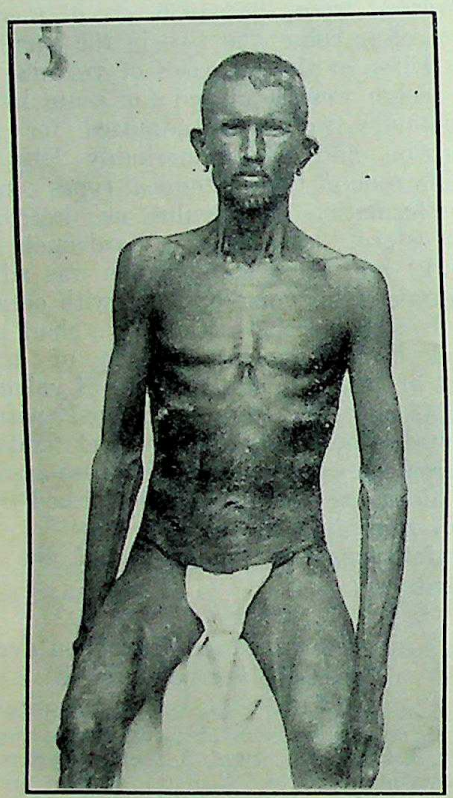

Fig. 1.—Case 2.

part of the pelvic colon behind the upper one. The pelvic colon was also markedly distended. Excision and end to end anastomosis of the pelvic colon was done with very good result.

Chronic cases of pyloric obstruction with chronic appendicitis and remarkably long meso-sigmoid with a tendency to volvulus formation

(5) A male aged 40 years was admitted for pain in the umbilical region of eight years' duration. The pain was periodical, coming at intervals of a month. It usually started in the morning and was relieved after taking food. Treatment was without benefit. For the past year before admission the pain had become more severe and constant, being relieved only slightly after taking food but more after induced vomiting. On inspection, marks of branding and visible peristalsis were noticed at the level of the umbilical region. Liver and spleen were not palpable. No masses were felt. All other systems were normal. Barium meal examination showed deformity of the duodenal cap with slight pyloric obstruction and the pelvic colon looked very prominent in the 24-hour picture. The biochemical curve showed the total initial acidity of 65 per cent and free hydrochloric acid 40 per cent rising to a fair concentration like a plateau in one and a half hours' time. On opening the abdomen with a right paramedian incision a cacatrized duodenal ulcer as well as chronic appendicitis were found. The pelvic colon presented itself in the region of the epigastrium. It was long and distended but with no signs of obstruction. It was of the anatomical type conducive to the formation of a volvulus. A posterior no-loop gastro-jejunostomy with appendicectomy was done, as well as excision of the pelvic colon with end to end anastomosis. Local anæsthesia with field block and splanchnic block was used, as the condition of the patient was poor. The patient had an uneventful recovery and was discharged cured.

(6) A very markedly emaciated female aged 30 years was admitted for pain in the abdomen of 16 years' duration, coming on after taking food. The pain had become more severe seven months before admission. Pain came after food and was relieved by vomiting. It started on the right side of the umbilicus and shot up to the epigastrium. Barium meal

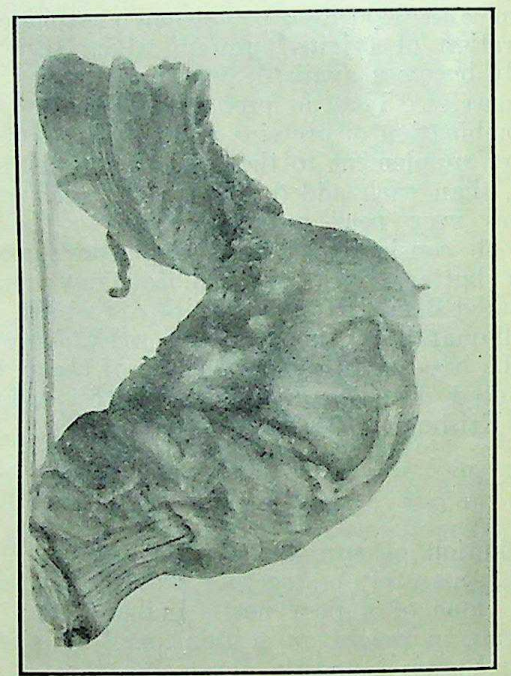

Fig. 2.—The specimen removed from case 2.

examination showed a markedly dilated stomach with very poor emptying. Barium was found in the stomach even in the 24-hour picture, showing a marked pyloric obstruction. The biochemical test was typical of a duodenal obstruction with 52 c.cm. of fluid in the stomach before starting the test and 200 c.cm. at the conclusion of the test. Under local anæsthesia, field and splanchnic blocks, the abdomen was opened by a right paramedian incision. A markedly cicatrized pyloro-duodenal ulcer was found with a dilated stomach. The appendix, which looked normal to the naked eye, was removed. On histopathological examination it was found to be chronically inflamed. A posterior no-loop gastro-jejunostomy was done. While suturing the stoma two ankylostomes were found. The pelvic colon was very long and distended with a tendency to volvulus formation. It was excised and end to end anastomosis was done. The histopathological examination of pelvic colon was as follows:—

'Mucous membrane shows adenomatous hyperplasia and is polypoid in places. Hyperplastic lymph follicles

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are found in the sub-mucous area. The muscular wall shows neuro-muscular hypertrophy'.

The patient was discharged cured.

Volvulus in small intestine causing acute intestinal obstruction

(7) A child two days old was admitted for constipation since birth. All external orifices including the anal orifice were found normal. The child had been given castor oil and calomel immediately after birth, a custom among the illiterate people. On admission the child was in a collapsed condition with abdomen distended and vomiting bile-stained fluid. Pulse was rapid and uncountable. Rectal examination showed nothing abnormal. Barium enema showed barium held up at the splenic flexure. Operation was performed under local anæsthesia, with a little open ether and oxygen, after preliminary treatment for improving the general condition of the patient. Right paramedian incision was used. On opening the abdomen, plum-coloured distended coils of small intestine were found hanging by a narrow pedicle, the axis of the pedicle being formed by the superior mesenteric vessels. There were three turns of the pedicle, anti-clockwise. The mesentery of the small bowel was not fixed and it looked as if the whole of the small bowel was hanging loose from the superior mesenteric vessels. An ileostomy was done, purely as a palliative measure.

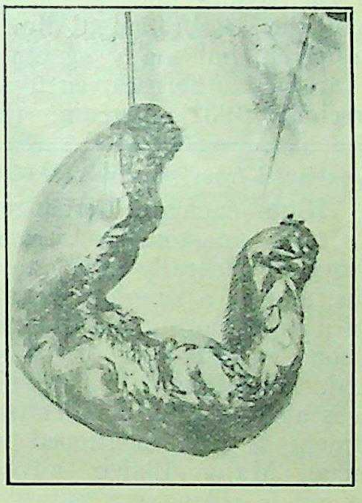

Fig. 3.—The specimen removed from case 3.

The abdomen was closed and the child died two hours after operation. A post mortem confirmed the findings observed on the table.

(8) A female child aged nine years with a history of colic since birth, coming on at irregular intervals, relieved by vomiting, was admitted for intestinal obstruction of eight days' duration. The child had absolute constipation with marked distension of the abdomen, ladder pattern was distinctly seen at the umbilical region. The general condition of the patient was poor, pulse feeble, vomiting was frequent and of a fæculent type. With preliminary administration of saline, the abdomen was opened under local anæsthesia combined with nitrous oxide and oxygen. On opening the abdomen gangrene of the small bowel was found and on exploration it was found to be due to a volvulus of the small bowel. The whole of the small bowel was found hanging like a pendulum the stalk being formed by the superior mesenteric vessels. The turn was from left to right about three times. The child's condition was grave on the table and it died subsequently one hour after the operation. Post mortem showed gangrene of the small bowel with thrombosis of the superior mesenteric vessels. In this case the cæcum was sub-hepatic and not fixed.

It is clear from the description of the cases given above that volvulus is a frequent cause of intestinal obstruction in India. The following statement shows the analysis of cases of 'acute abdomen' admitted and treated from the year 1932 to 1935 :—

	Number	Percentage
Strangulated herniæ ..	38	30
Appendix with complications ..	18	14
Intestinal obstruction ..	18	14
Distended bladder with retention of urine	12	9.5
Intestinal colic	12	9.5
Duodenal or gastric perforation	9	7
Liver and gallbladder ..	10	8
Other causes	8	6.3
Pancreas	1	8
TOTAL ..	126	106.3

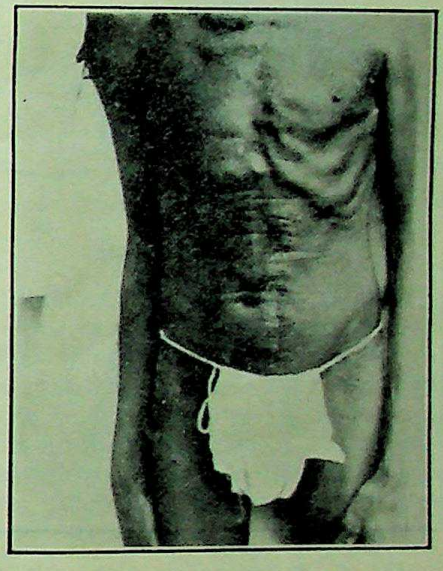

Fig. 4.—Case 3.

Out of 126 cases of 'acute abdomen', 18 were due to intestinal obstruction. Out of these, five were due to volvulus, three of the pelvic colon and two of the small intestine. Subsequent to the analysis one case of volvulus, causing acute intestinal obstruction, was admitted and treated, and two more cases were found with potential tendency to the formation of a volvulus in cases admitted for pyloric obstruction due to cicatrized duodenal ulcer.

Three forms of volvulus were described by Rokitansky :—

(1) Rotation of bowel on its longitudinal axis.
(2) Rotation of bowel on its mesenteric axis.
(3) Intertwining of two coils of intestine.

In the cases reported above, there were two cases of volvulus, which occurred as the result

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of rotation of the bowel on its mesenteric axis, and these were found in children with congenital abnormalities in the small intestine. The other cases occurred in the pelvic colon and were probably due to rotation of the bowel on its longitudinal and mesenteric axis. There were no cases illustrating the third type of Rokitansky.

It becomes apparent from an analysis of these cases that volvulus, when it occurs in the large bowel, usually involves the pelvic colon. The age incidence is after the third decade of life. Is this the result of changes in the large bowel due to chronic bowel infection which is so common in India? In one specimen removed, because of the potential danger of formation of volvulus, during an operation for pyloric obstruction, the pathological report showed changes which occur in chronic inflammatory conditions. The various anatomical types of pelvic colon which are conducive to the formation of volvulus

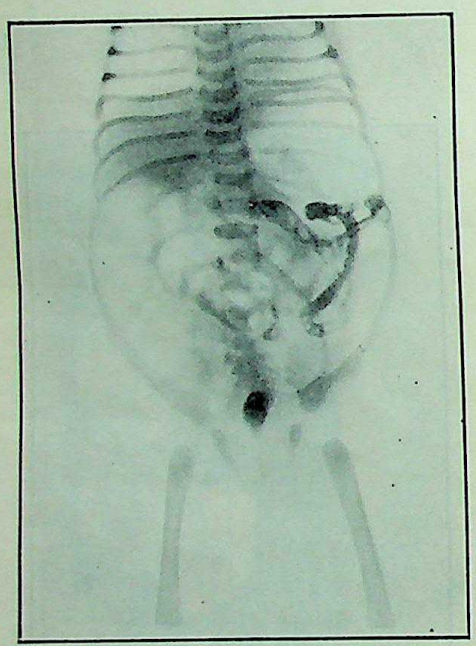

Fig. 5.—Barium enema picture of case 7.

must exist in other countries where, however, incidence of volvulus is rare. It is noteworthy that the countries where the incidence of volvulus is not infrequent are those in which chronic large bowel infection such as dysenteries are also common. It may be suggested that the changes observed in the pelvic colon in case 6 may have probably more than a fortuitous relation to the tendency to formation of a volvulus observed in it. Chronic inflammatory hyperplasia of the mucosa and the neuro-muscular hypertrophy of the wall may be the anatomical substrata of a functional inco-ordination in the motor mechanism of the bowel resulting in the formation of a volvulus.

A survey of the literature on treatment of this condition shows no definite line of treatment

(*Continued at foot of next column*)

SPINAL ANÆSTHESIA

By C. H. BLISS
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MANY techniques for the induction of spinal anæsthesia have been described in the past so it is with some diffidence that a new one is suggested. Most methods seem to be somewhat unwieldy, notably that of Jones (1930). In India a simple method is almost a necessity. A technique which makes use of the dorsal curvature to control the level of anæsthesia has not, according to the writer's knowledge, been described previously.

In the description which follows doses are given for a normal adult of about 140 lb. in weight; these doses must of course be flexible and will be varied according to the condition and physique of the patient and the type of operation to be performed.

Anæsthetic agent

There are a great number of anæsthetic agents on the market; the one selected should be non-irritant to the tissues and of lower specific gravity than the cerebro-spinal fluid. Spinocaine is preferred, but many agents are advocated by various authorities, such as tropacaine (Kirschner, 1931), percaine (light), and

(*Continued from previous column*)

advocated. High enemata, complete excision and end to end anastomosis are mentioned. Books on surgery generally advocate untwisting the volvulus, and as a simple measure the performance of a cæcostomy in addition, as a safety valve. In some cases fixation of the pelvic colon is advocated. Plication and shortening of the meso-colon is also mentioned. Primary excision as a treatment is just mentioned in passing. My colleague, Major Ebden, advocated and excised the pelvic colon as a curative measure in conditions of volvulus causing intestinal obstruction. Encouraged by his results all the cases of volvulus of pelvic colon reported above were treated with primary excision of the pelvic colon with end to end anastomosis with very good results. In my opinion this is the best line of treatment to be adopted for volvulus of the pelvic colon, provided the condition of the patient warrants such a procedure. It is noteworthy that gangrene of the bowel is a very late manifestation in volvulus. It was seen on post-mortem examination in one case admitted moribund with obstruction of 8 days' duration.

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neocaine (Bailey, 1936). Novocaine is another agent which may be used. It should be in 10 per cent solution because it must be strong enough to have the same effect as one of the proprietary preparations. This solution has no fixative and should therefore only be used when absolutely necessary, and with due precautions.

The heavy anæsthetic agents such as percaine (heavy) or stovaine are mentioned merely to condemn. They necessitate the patient being kept with the head up; a posture which precludes the best treatment for the fall in blood pressure which inevitably occurs in this position.

The choice of spinocaine depends on the following factors :—

1. It is light, S. G. 1,000.5 (C. S. F. 1,006–1,008).
2. It is almost non-irritant.
3. It is fixed quickly.
4. The anæsthesia lasts a long time with small quantities.
5. It keeps well and is conveniently dispensed.

A considerable amount of duracaine has been used but has been given up as it was found that the length of anæsthesia was often inadequate and that it was slightly irritant, as evidenced by occasional cases of retention of urine.

Spinocaine, S. G. 1,000.5.

Composition—Novocaine	..	mg. 200
Amylo-prolamine (gliadin)		mg. 130
Ethyl hydrate	..	mg. 300
Strychnine	..	mg. 2
Normal saline	*q.s.*	c.cm. 2

The gliadin allows the spinocaine to mix but not to diffuse with the cerebro-spinal fluid, or, in other words, the anæsthetic agent is rapidly fixed and the anæsthesia lasts longer.

Anatomy and physiology

The space between the third and fourth lumbar vertebræ lies on a level with the highest point of the iliac crests. It is this space which is most commonly used for the insertion of the needle, in spite of the fact that the widest interspinous space is that between the fourth and fifth lumbar spines. The spinal cord ends at the disc between the first and second lumbar vertebræ; the nerves of the cauda equina are bunched closely together at this level and as far down as the third lumbar vertebra. For these two reasons injection should never be made above the third lumbar vertebra. Malik (1937) advocates, for gastro-jejunostomy, injection between the twelfth dorsal and first lumbar vertebræ. This is unnecessary. High injections run the definite risk of touching a nerve root or even the cord itself, possibly resulting in a subsequent paralysis.

The sympathetic outflow, upon which blood pressure depends, is by the white rami communicantes accompanying the anterior roots of the first thoracic nerve to the second or third lumbar nerves. The distribution of these nerves is briefly as follows :—

1.	Anterior limb ..	T 1–3	Constrictor.
2.	Posterior limb ..	T12–L2	Constrictor.
3.	Head	T 2–5	Constrictor.
4.	Abdominal viscera	T 6–L5	Constrictor.
5.	Coronary vessels	T 1–5	Dilator.
6.	Pulmonary vessels	Upper thoracics.	Constrictor.

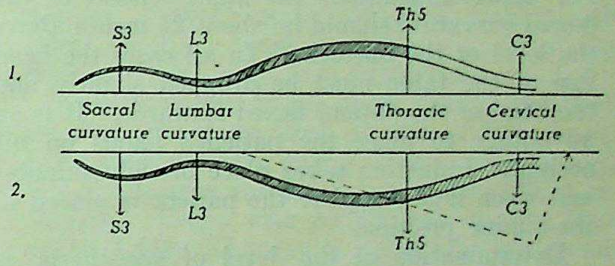
From this it will be seen that the blood pressure will fall dangerously and vital functions be interfered with if paralysis extends above the fifth thoracic nerve root.

The body of the fifth thoracic lies on the same level as the tip of the fourth thoracic spine, and the fifth nerve issues below the corresponding vertebra.

Technique

It is intended to deal with this in two parts; firstly with the theoretical factors upon which the procedure depends and, secondly, with the practical details adopted.

Diagram to illustrate the use of the dorsal curvature to determine the level of anæsthesia.



The diagram represents the position of the spinal canal in the prone position (1) and in the supine position (2). In the prone position it is obvious that the anæsthetic agent can flow easily up to the highest point to Th. 5; it cannot flow past this as the remainder of the curve is kept definitely downwards. In the supine position, however, the conditions are reversed and the anæsthetic agent will remain at L3 which is now the highest point. To make it rise to Th. 5 the patient must be tilted to the position shown by the dotted line but in this position C3 will be higher than Th. 5 and the anæsthetic agent will therefore flow on upwards. Therefore the height to which it flows is not controlled. By using the dorsal curvature in the prone position the anæsthetic level can be accurately determined. It is only necessary to place the patient in such a position that the uppermost nerve root to be anæsthetized is at the highest level. All other roots cranially are kept at a lower level.

Full aseptic precautions should be observed throughout, the injection area surgically prepared and the anæsthetist should wear cap, gloves, gown and mask. The needle should be as fine as possible so as to cause a minimum amount of trauma. The skin should be anæsthetized with the special novocaine-ephedrine solutions recommended by the makers. The patient is placed in the left lateral position and

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as soon as the injection has been made he is turned on to his face for eight minutes. The injection is never made higher than the space between the third and fourth lumbar vertebræ. Directly the patient has been turned on to his face the table is tilted in such a way that the anæsthetic flows up to the height to which anæsthesia is required.

Table showing dosage, barbotage and tilt of the table

Operation	Quantity of spinocaine	Barbotage *	Tilt of the table
Pelvis, legs, etc.	2 c.cm.	Nil	Buttocks up
Lower abdomen	3 c.cm.	1–2 c.cm.	Level
Upper abdomen	3–4 c.cm.	3 c.cm.	Thorax up

* Barbotage is the amount of spinal fluid to be mixed with the anæsthetizing agent.

The above dosage (using spinocaine) is sufficient to give an anæsthesia lasting for at least two hours. The tilt of the table is important, as upon this depends the height of anæsthesia. For upper abdominals the highest point of the dorsal curvature should be about 2½ inches above the level of the buttocks. In all cases the head flap of the table must be dropped slightly and the head of the patient flexed forwards. It is an advantage to place the patient's hands on his occiput. Induction takes place in eight minutes and when it is complete the patient is placed in the supine position.

Determination of the level of anæsthesia is by inspection of the abdomen which shows a characteristic scaphoid appearance due to the relaxation of the abdominal muscles.

Pre-operative treatment

It is not considered that purges or enemas are indicated before any type of anæsthesia as they result in an adverse fluid balance, which is further aggravated by the operation itself, whatever form of anæsthesia is used. The stomach should not be full, as it is important that the diaphragm should in no way be embarrassed.

Some degree of premedication is desirable if the patient is at all nervous, and the following is suggested :—

Nembutal grains 3 one and a half hours before operation followed by omnopon-scopolamine 1 c.cm. three-quarters of an hour before operation. Too much premedication is to be avoided as it tends to depress the medullary centres. Scopolamine is of value for its amnesic properties.

Indications

Spinal anæsthesia is indicated for all major operations below the costal margin and in most cases where an inhalation anæsthetic is contra-indicated. The contra-indications are discussed later.

Relative indications include the perfect relaxation obtained, the collapse of the gut, absence of the neurogenic factor in shock, less bleeding, no systemic reaction of the organism as, for example, the altered acid-base ratio which occurs in ether anæsthesia.

Contra-indications

The only real contra-indications are:—Marked organic disease and the moribund patient. 'Spinal anæsthesia is the sure way of killing the moribund' (Ashworth, 1937).

Lowered blood pressure, perforations of the gut, general peritonitis and widespread sepsis are not contra-indications unless accompanied by toxæmia so profound as to have rendered the patient moribund. Intestinal obstruction (as stated by Malik, 1937) is not a contra-indication as the collapse is passive. Indeed intestinal obstruction is a very definite indication for this type of anæsthesia.

Complications

1. Headache is probably most to be dreaded, but should not occur at all seriously in more than 2 per cent of cases. The causes are said to be escape of the cerebro-spinal fluid, rapid withdrawal of cerebro-spinal fluid for barbotage and effusion of blood into the cerebro-spinal fluid. These chances are reduced by using a very fine needle. Further causes are said to be injection of foreign agents such as iodine, the anæsthetic agent itself, saline, etc. These probably have no effect (Koster, Kasman and Shapiro, 1937). The most likely cause of headaches following interference with the spinal canal is alteration in pressure of the cerebro-spinal fluid.

2. Vomiting is not an important complication; it occurs more than once in only 4 per cent of cases. The writer has never yet had a case of cyclical vomiting nor a case which required any treatment.

3. Flatulence occurs as in any abdominal case and is dealt with in the routine manner.

4. Retention of urine is rare and occurs in the same type of case as with any other anæsthetic.

5. Pain in the shoulders during an operation on the abdomen is due to interference with the diaphragm stimulating the phrenic nerve whose root value is C3-5.

6. Broncho-pneumonia is a negligible complication. Its pathology is probably due more to the manipulations of the surgeon than the anæsthetist (Osborn, 1938).

7. Meningitis or paralysis has never been seen by the writer.

The blood pressure

The fall in blood pressure depends on several factors, the most important being the posture

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of the patient and the level of anæsthesia. The most important sympathetic nerves controlling the blood pressure are among the white rami communicantes of the first to fifth thoracic nerves. If these are not interfered with the fall in blood pressure will be minimal.

It is hoped that in a future communication it will be possible to show exactly what occurs to the blood pressure under spinal anæsthesia.

The following case of jejunostomy is illustrative of what appears to occur :—

Mrs. F.

Level of anæsthesia just above the nipples.

Time	Manipulation	Blood pressure	Pulse
11-54	Before giving anæsthetic ..	146/62	62
12-04	Two minutes after giving spinal injection.	140/76	..
12-10	Anæsthesia complete ..	132/80	..
12-35	Fifteen minutes after operation started.	82/62	..
12-41	CO_2 and O_2 for one minute. Respirations deepened.	125/75	94
12-45	.. ..	120/70	90
12-49	O_2 for one minute. Patient roused.	120/80	108
12-52	.. ..	105/65	..
12-58	CO_2 and O_2 for one minute ..	120/80	108
1-02	.. ..	105/70	..
1-06	Abdomen closed. Legs raised 90° for two minutes.	130/80	104
1-09	.. ..	115/75	..
1-10	Head up. Feet down. Groaning and retching.	Unobtainable.	
1-12	Head down. Feet up ..	135/85	..

(Record of case taken during operation by an independent observer.)

This shows clearly that the remedy for low blood pressure in these cases is posture and CO_2 to breathe.

The writer has had one death in about 200 cases and has observed 200 further cases in which no death occurred. This death occurred at a time when this form of anæsthesia was looked upon more as a massive local than as a general anæsthesia and it was thought that there were no contra-indications. The patient was a moribund man with advanced carcinoma coli invading even the abdominal skin.

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INCIDENCE OF PULMONARY TUBERCULOSIS IN THE PUNJAB VILLAGES

By B. L. KAMRA

CAPTAIN, M.B., B.S.

Medical Officer in charge, Sohangarh Rattewala Dispensary, Tehsil Muktsar, District Ferozepore

IN this article an attempt has been made to estimate the prevalence of pulmonary tuberculosis in this rural area of the Punjab. Little apology is due for such an effort as no accurate estimate has so far been possible of the incidence of this disease in Indian villages and if ever such has been tried it has been in a rural area close to a town, thus fully effected as regards urbanization. Purely rural figures, if available, have been collected through vaccinators and village chowkidars, so they are worth very little. Here figures have been collected from the patients attending the outdoor department of the above dispensary and coming from the surrounding villages in the Ferozepore district. The sputa of all the suspicious cases were examined microscopically and only those showing acid-fast bacilli have been included as suffering from the disease. Sputum could not be collected easily from children; those above ten years of age, therefore, have only been taken account of.

This dispensary serves many villages but those situated within an area of about 100 square miles send patients almost daily. The villages within this area are thirty in number. They are all small villages with populations varying from 190 to 1,440. This group is not wholly dependent upon this dispensary for its medical aid; there are four other dispensaries to which many of these villages are nearer than they are to this one. Besides there are many quacks to attract the patients. But this dispensary being the most popular, there cannot be many patients suffering from pulmonary tuberculosis who have not attended here some time during their long illness. Therefore, the figures given below are probably not far below the true incidence.

These villages are inhabited by three classes of people—landlords, cultivators and labourers. Landlords are well-to-do, they can afford better houses and better food but they constitute a negligible part of the total population. Labourers are the poorest financially, they are ill-housed, ill-clad and ill-fed. Cultivators are not better off than the labourers, from their ignorance of the rules of hygiene and dietary. They constitute the majority in the villagers. Total population concerned is 15,884 and according to the revenue records the total income has been estimated at Rs. 10,87,702-8, produced by 48,036 acres of cultivable land per year. About one-half of this produce goes to the landlords. The remaining population, hence, gets about Re. 0-1-6 per head per day. This is the financial condition of the people in fertile areas such as this !

The dietary habits of the people are almost uniform. Most of the Hindus and Sikhs and all

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Mohammedans are non-vegetarians but meat is taken only occasionally and in a small quantity at a time. It is taken as a relish rather than as a staple article of diet, which consists mostly of wheat flour. The dietary of the people does not lack in vitamins and salts. Diseases due to their deficiency are not very common and the condition of most of those found with avitaminosis may be attributed to general constitutional defects due to causes other than dietary deficiency. Hindus and Sikhs take food richer in fats than the Mohammedans. Scarcity of milk is increasing. Onions, *sarson ká ság*, green gram and buttermilk, however, with wheat in the adult dietary leave little to be desired.

Open air is nature's best gift to a villager. However, during the winter months the habit is for the family to sleep together, huddled up in one room, ill-ventilated as a rule, giving even rather less cubic space per person than in the towns. The sleeping room is never separate. It is packed up with all sorts of furniture, the store of raw food material is also to be commonly found in the sleeping rooms. The food during the winter and rainy days is also cooked there. Almost every roof in a house is found blackened with smoke.

No latrines are to be found in the premises of the houses. People defecate outside the village in its close vicinity. Young children and infants defecate in the courtyards of their houses and in the streets. There is none to look after the cleanliness of a street. It is usual to find them dirty with refuse. Drains are nowhere to be found.

The respiratory tract is the most frequent avenue of infection, and sputa from infected cases is a great source of the tubercle bacillus. Here we live eight months during the year in an atmosphere thickly laden with street dust—without doubt a fertile source of infection, but thanks to frequent dust-storms, the load of bacilli in the street air is very much diluted. Such in short is the sanitary condition one meets with in the villages around here.

The total area used for residential purposes (streets, ponds, cattle courtyards and places for other village necessities included) in all these villages is 614 acres. The total population is 15,884 men and women and 13,674 cattle. On the average, therefore, 100.5 square yards are used per living animal. This condition of overcrowding may compare well with that in towns, for which I have no figures to quote, but, as mentioned above, during winter months it is the habit to sleep together in closed rooms with very little cubic space per person.

Purdah in its strict sense is practically nowhere to be found except that a few landlord families and those of mosque mullahs are the victims of this practice.

The total number of new cases treated in the outdoor department during the period extending from 13th December, 1935, to 31st March, 1938, has been 29,464. Amongst these 18,640 patients were above 10 years of age. Out of these 53 were found to be suffering from pulmonary tuberculosis, giving the ratio of 1 to 351.7 patients. The total number of females treated during the period was 7,017 and amongst these 20 were found tuberculous, giving the same ratio. This is what one would expect as purdah and early marriage are almost non-existent here.

The number of tuberculous patients, who attended this dispensary for treatment during the last two years, was 28, giving the incidence of one case per 567.3.

During the years 1936 and 1937 the total number of deaths recorded in these villages was 809, amongst which 274 were deaths in persons above 10 years of age and 22 were amongst tuberculous patients, who were diagnosed to be such by examining their sputa in the laboratory, that is, one death per 12.5 was due to pulmonary tuberculosis.

So far it has been held that the disease is mainly an urban one. 'Urbanization has provided the spark but it will be in the villages where the fire *will eventually burn** most fiercely' says the Editor commenting on the tuberculous problem in India in the *Indian Medical Gazette*, Calcutta, February 1935. The fire is already actively burning in the villages as is shown by the figures given above. The problem elsewhere must be worse than it appears here, as this area is relatively very healthy and better off financially than many others.

I acknowledge my indebtedness to Lieut.-Colonel K. R. Batra, I.M.S., Civil Surgeon, Ferozepore, for useful advice and kind permission to publish this article.

A Mirror of Hospital Practice

TWO CASES OF TREPONEMAL INFECTION TREATED WITH PARITRAN PREPARATIONS

CASE 1

By A. N. MUKHERJI, B.SC., M.B. (Cal.), L.R.C.P. (Lond.), F.R.C.S. (Eng. and Edin.)
Visiting Surgeon, Carmichael Medical College Hospital, Calcutta

MRS. X, aged 40 years, sought advice for the cure of patches of what she called dry eczema two of which were prominent and unsightly, being situated near the elbows. They gave her little or no trouble beyond a slight irritation in hot and damp weather.

She was married 20 years ago and had five conceptions. Her first child, 19 years old, was born with talipes, cleft palate and other deformities. She has Hutchinson's and Moon's teeth, is physically underdeveloped and wanting in intelligence. There is no

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evidence of congenital syphilis in the remaining three children. Her fifth conception terminated in miscarriage. Her parents are in good health. Her younger sister has pigmentary syphilides; she is mentally 'overstrung' and the Wassermann and Kahn tests are strongly positive. She has had a miscarriage. Her husband's blood gave negative Wassermann and Kahn reactions.

She had four patches of scaly psoriasis with pigmented margins situated in the regions of the elbows and ankles. She complained of unusual dryness of the skin of the lower parts of her legs. The epitrochlear lymph nodes were palpably indurated.

Her Wassermann reaction was 4 to 10 and Kahn test positive. She was given twelve injections of arseno-paritran and bismo-paritran with interruptions, as she had to leave Calcutta for three weeks and discontinue treatment. On her blood being tested one month after the last injection, it was noticed that Wassermann reaction had gone up to 10 to 10 and Kahn still positive though the patches of psoriasis had disappeared leaving the skin smooth. The dry feeling of the skin was also less. She was now put on an intensive course of twelve injections each of arseno-paritran and bismo-paritran bi-weekly. On the blood being tested one month after the completion of this course, Wassermann and Kahn tests were both negative. Psoriasis never returned after its first disappearance though she thinks that there is still a slight dryness of the skin of her leg.

CASE 2

By P. C. SANYAL, M.B. (Cal.), F.R.C.S. (Eng.), L.R.C.P. (Lond.)

Visiting Surgeon, Medical College Hospitals, Calcutta

C. K. J., aged 40 years, was an assistant to a medical practitioner who has an extensive venereal practice. His wife conceived on six occasions, one resulting in miscarriage and one in death due to neo-natal asphyxia; the four remaining children are apparently healthy. His wife is in fairly good health. He had an exposure sometime before his marriage, resulting in a mild form of urethritis. Neisserian organisms were not found in the discharge which disappeared with local treatment. Some time later he noticed weakness in his control over micturition which developed into incontinence. Later still he suffered from vague nervous symptoms such as insomnia, twitchings of the extremities and loss of concentration.

When he consulted me in March 1937 he said that he never had syphilis and the object of his visit was for the relief of incontinence of urine. His Wassermann reaction was 6 to 10. On examination his prostate was not found enlarged though it was soft and boggy; there were evidences of prostatorrhœa, and his urine collected after prostatic massage yielded streptococci. A full course of autogenous vaccine, lavage, instillations and diathermy gave some relief to the urinary symptom and helped to clear streptococci, but incontinence continued. He was recommended an intensive course of arseno-paritran injection. He took these injections and called in January 1938, some time after the course was completed, to report that though the dribbling and incontinence were definitely less, he has not had complete relief. There was a marked improvement in his general condition. His blood was tested for Wassermann reaction with negative results. He was then given prostatic extracts, orally and by injection, but without relief. He was now given some bismo-paritran injections; thereafter he got further control over his bladder.

A LYMPHO-SARCOMA IN THE BLADDER

By J. F. HENRIQUES, L.M. & S., F.C.P.S., B.M.S.

Civil Surgeon, Bijapur

A BOY, age 10, was admitted for a suspected stone in the bladder which appeared to be felt on sounding. The boy suffered from symptoms like those of stone in the bladder. Litholapaxy was tried, but instead of the stone some part of a fleshy growth seemed to be caught by the blades of the lithotrite. A suprapubic cystotomy was therefore done and the growth appeared to be an enlargement of the prostate. This was unusual in a boy of 10, though later I found, according to Boyd's Pathology, that it does occur in the rarest of circumstances in young people. I shelled it out easily. I did not feel any other growths in the bladder and the boy was in hospital from 7th to 27th January, 1938, and was discharged cured. The growth removed was inadvertently thrown away by the sweeper.

On 13th February, he was readmitted. Whilst playing he fell on his abdomen. He came with a gaping wound at the old operation scar. He was dressed in the usual way and it was thought the wound would heal in a few days. After six days, I was sent for urgently, one night, as there was a sudden severe hæmorrhage through the wound. I performed an exploratory operation and, on dilating the wound, was surprised to find a number of soft growths mostly sessile, in the bladder; these I began to remove with my fingers. They varied in size from small marbles to pigeons' eggs and were about 48 in number. The whole operation took nearly an hour and was a most trying and difficult one. The patient became very low during the operation, but I was able to finish it and as far as I could feel there were no masses left behind in the bladder.

Though the wound seemed to be healing, he looked anæmic and seemed to be going down gradually. He was discharged at the request of his people after about three weeks, with a small sinus still persisting.

The report on the tumours from the Haffkine Institute was as follows :—

'Composed of gelatinous mass. Sections show areas of small cell infiltration separated by bands of connective tissue. The vessels are hypertrophied and at places the tissue is undergoing myxomatous change'. Subsequently, as the laboratory found the case very interesting almost all the masses removed were sent. Their report on these was :—

'The structure is that of malignant lympho-sarcoma, which in the bladder is comparatively rare'.

A CASE OF EXTENSIVE SCALDING TREATED WITH COD-LIVER OIL DRESSING

By K. P. HARE, M.B., B.S. (Lond.), L.M.S.S.A.

Medical Officer, Tingri Medical Association, Assam

DURING the past two years I have used cod-liver oil extensively as a dressing in the treatment of burns, scalds and other wounds involving extensive damage to the skin and have been much impressed by its efficacy. I have, however, been surprised to find that many of my professional colleagues have had no experience of it and am therefore recording the following case which illustrates some of the advantages of this technique, *viz*, ease of application, painless dressings reducing shock to a minimum, absence of secondary infection and speedy epithelialization.

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History.—The patient, a male tea-garden coolie, aged 35 years, was admitted to hospital on 27th February, 1938, suffering from severe scalds sustained the previous night when an earthenware vessel, in which he was cooking rice, burst. He was very shocked.

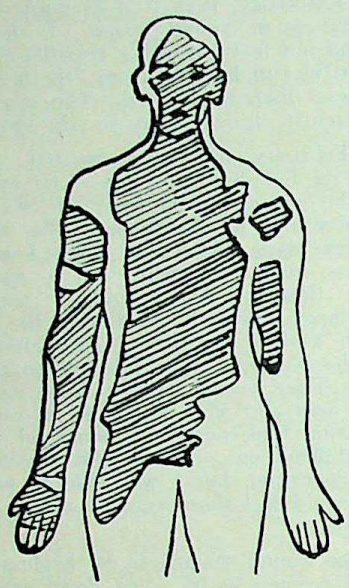

Fig. 1.

The greater part of the anterior surfaces of the head, neck, chest, abdomen and both arms was scalded. The exact distribution is shown by the shaded area in figure 1 and the general appearance is well seen in the photograph (figure 3) taken two days later.

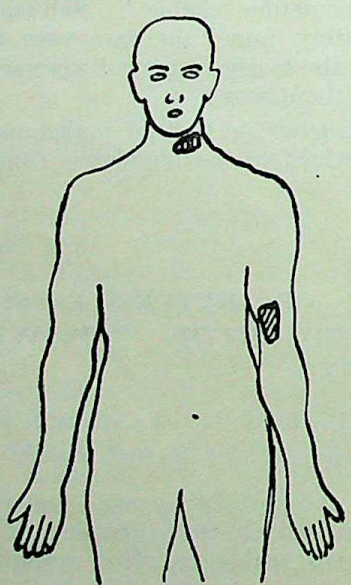

Fig. 2.

Treatment.—The wounds were cleansed with warm boric lotion and dressed with lint soaked in cod-liver oil. The dressings were held in position by light bandaging. Morphia gr. ¼ was administered and complete rest in bed enjoined, the foot of the bed being raised. Subsequently the cod-liver oil dressings were renewed daily.

Progress.—The initial shock was quickly overcome and the daily dressings caused no distress. There was never any tendency towards suppuration and healing

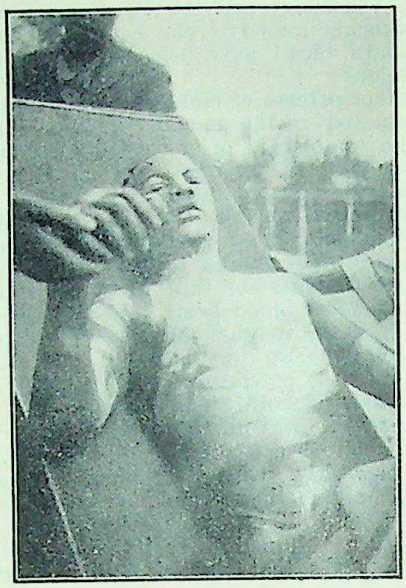

Fig. 3.

proceeded rapidly and steadily. There was no elevation of temperature at any time. The second diagram (figure 2) and the photograph (figure 4) taken on 23rd

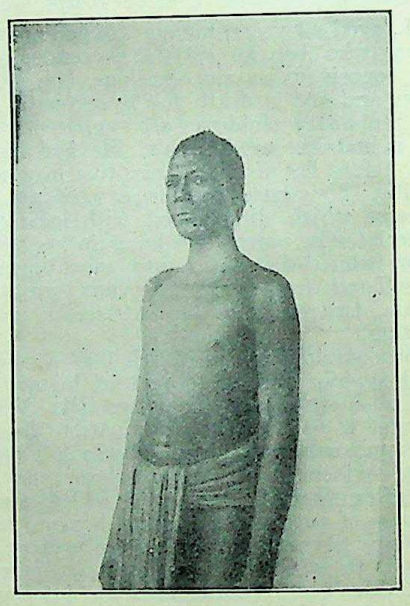

Fig. 4.

March show the remaining extent of the wounds on that date. The patient was discharged from hospital with all wounds completely healed on 26th March.

A Correction

IN the article '*Bertiella studeri*, a natural tape-worm parasite of monkeys, in a Hindu child', which appeared in the June number of the *Gazette*, p. 346, it is stated Dr. B. M. Das Gupta examined the stool; this is not correct, the contributor, Dr. S. C. Roy, himself made this examination.—Editor, *I. M. G.*

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Indian Medical Gazette

AUGUST

BENZEDRINE: ITS USE AND ABUSE

Benzedrine is a trade name given to a synthetic drug known as beta-phenylisopropylamine which is chemically related to ephedrine and to a less extent to adrenaline and is comparable to them in its pharmacological effects. The various curious effects of this substance, which remained unnoticed for two decades after Barger and Dale discovered it in 1910, have recently begun to attract the attention of investigators. Its principal physiological effects are stimulation of the central nervous system, including the higher cerebral centres, pressor effect on the vasomotor system and anti-spasmodic action on the smooth muscles of the gastro-intestinal tract.

Clinically, the sympathomimetic action has been frequently utilized in the treatment of congestion of the nasal mucosa in conditions such as coryza, and vasomotor rhinitis. Benzedrine brand inhalers, supplied in convenient tubes and distributed liberally to the medical profession as free samples, appear to have increased its use in recent years. In hay fever and similar conditions, it may give great relief, but it is doubtful whether the frequent use of vasoconstrictor drugs applied locally is justifiable in inflammatory conditions of the nose and related parts when due to infections. The drug has also been advocated for maintaining blood pressure during spinal anæsthesia and orthostatic hypotension. Its anti-spasmodic action has been utilized, mainly to facilitate *x*-ray investigation of suspected peptic ulcer or other conditions associated with spasm. The stimulating property of the drug to the higher centres of the brain, which is more marked than that of ephedrine, led to the idea of using it to treat mentally depressed cases in psychopathic institutions, but with little success until oral administration was introduced.

During the past two years a non-volatile salt of benzedrine—the sulphate—has been introduced and extensively exploited as a stimulant to the brain. The present vogue of the drug lies mostly in the treatment of narcolepsy and beneficial results have been obtained. Various conditions associated with fatigue, depression and lethargy have been benefited by its administration. The distressing symptoms of post-encephalitic Parkinsonism such as drowsiness during the day, oculogyric crisis and the feeling of exhaustion, which are not affected by the administration of atropine and related drugs, are better controlled by the exhibition of benzedrine sulphate. When administered by mouth in 2.5 to 10 mg. doses (occasionally increased to 20 mg.) before breakfast, and lunch if necessary, it relieves the fatigue, increases the capacity for work and gives a feeling of exhilaration. Such stimulation is found to be greater in patients depressed from toxic or organic causes such as alcoholism than in those with purely psychologic disorders. It must be admitted, however, that these results are purely subjective and the stimulation is not permanent.

Benzedrine acts differently in different individuals. Experiments on normal persons have shown that a feeling of well-being, talkativeness and an increase in motor activity are the most frequent changes. But some people develop a state of irritable restlessness and unpleasant sensations. The undesirable effects are dryness of the mouth, anorexia with consequent loss of weight, palpitation, precordial discomfort, tremor and insomnia.

As it prevents drowsiness and depression students began taking it for the purpose of keeping awake and preventing fatigue when preparing for examinations, instead of the old favourites, tea or coffee. Such a practice should obviously be condemned. The relief of fatigue and the stimulation of mental activity cannot be maintained for any appreciable period without subsequent periods of depression. It amounts to 'whipping a tired horse' rather than giving a 'pick-me-up' to a sluggish one. Cases of collapse, fainting and insomnia have been observed as a result of its misuse. The action of the drug is not yet thoroughly understood, and there are undoubtedly risks of severe reactions from its effect on the circulatory system.

Recently, a pharmaceutical student in England, while preparing for the final examination, took the drug in moderate amounts for 19 days. He developed acute aplastic anæmia, and severe cardio-vascular collapse occurred the day after the last dose was taken. Physicians may well keep this drug in mind, when they encounter cases of fainting, exhaustion, and collapse of obscure origin.

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At present, benzedrine can be freely purchased from chemists. This will probably lead to its indiscriminate use by the lay public, without medical supervision, a thing to be deprecated, for caution is clearly advisable, especially in its administration to normal or relatively normal people, as distinct from those suffering from chronic or incurable diseases.

Medical News

THE VICEREINE MAINTAINS ANTI-TUBERCULOSIS DRIVE

ALTHOUGH Lady Linlithgow is now in England, she has not forgotten the Anti-Tuberculosis Fund and is actively helping the efforts of the Tuberculosis in India Appeal Committee in London to raise money by various means.

Under her distinguished patronage, as well as the patronage of Lord Zetland, Lord Halifax, Lord Willingdon, Lord Hardinge of Penshurst, Lord Stanley, M.P., the Dowager Marchioness of Reading, Sir Atul Chatterjee and Sir Firozkhan Noon, various film and other entertainments are being organized to raise money.

Charity entertainments have been arranged, including a Garden Fête to be held on 7th July, at the High Commissioner's House at 49, Putney Hill. Lady Linlithgow is expected to perform the opening ceremony of this fête, at which Indian ladies will be in charge of the numerous stalls.

The Committee has circulated copies of the appeal for the King-Emperor's Fund to about 170 firms with business connections in India, the majority of which have replied that their Indian branches were making contributions to the Fund in India.

It is learnt that the President of the India League of America is planning to form a Committee composed of both Indians and Americans to bring the appeal to the notice of Indians and other sympathisers residing in America and Canada.

KING-EMPEROR'S ANTI-TUBERCULOSIS FUND

ELEVENTH AND TWELFTH SUBSCRIPTION LISTS
GRAND TOTAL NOW RS. 42,73,044

THE eleventh and twelfth lists of subscriptions actually received up to 15th May, and 31st May, 1938, in response to Her Excellency the Marchioness of Linlithgow's appeal for the King-Emperor's Anti-Tuberculosis Fund, amount to Rs. 3,20,644-9-6 and Rs. 3,24,114-13-11, respectively, which bring the grand total of cash in hand to Rs. 42,73,044-0-11.

ANTI-EPIDEMIC WORK IN CHINA

TECHNICAL CO-OPERATION WITH THE LEAGUE OF NATIONS

The constitution of the League Epidemic Commission

THE three medical units—the first under Dr. Mooser (Swiss), the second under Dr. R. C. Robertson (British) and the third Dr. (Inspector Général) Lasnet (French)—arrived in Hongkong early in January.

The epidemic commission consists of the three commissioners, together with a representative of the Chinese Government (at first Dr. J. Heng Liu, later replaced by Dr. Robert Lim) and Dr. Borcic (Yugoslav), the League of Nations' Technical Adviser on public health questions to the Chinese Government, who has spent the last six years in China.

In his statement to the epidemic commission, Dr. Liu gave a vivid idea of the consequences of the war in terms of human suffering. The wounded, he said, could be counted by the hundred thousand, the homeless and destitute numbered millions and there were many millions of sick who could get no medical care.

'The migration of the population during the past few months has been unprecedented in the history of the Chinese people. Everywhere in the country, in villages as well as in cities, utilizing every means of communication, including railways, waterways, highways and aeroplanes, people are going and coming in inconceivable numbers. Soldiers are being moved about in millions from one part of the country to the other. There is overcrowding everywhere, and as circumstances make it necessary to ignore even the first principles of hygiene and sanitation, all kinds of sickness are spreading rapidly and widely.

The medical services in different parts of the country are already disorganized in the attempt to strengthen the army medical service. Many hospitals, including foreign missionary institutions, have been bombed, or for other reasons had to be evacuated. Private practitioners and nurses are themselves often fleeing refugees.

All of this will result in a series of epidemics in the control of which the most modern methods of preventive medicine and hygiene will be severely tested. I can visualize people, civilians as well as soldiers, dying in millions from influenza, smallpox, typhus, relapsing fever, diphtheria, scarlet fever, typhoid, dysentery, cholera, measles, malaria, tuberculosis and every other infectious disease. Diseases resulting from malnutrition, such as rickets, scurvy, beri-beri, pellagra and others resulting from inanition or vitamin deficiency will add to the number of deaths.'

Dr. Liu went on to promise the epidemic commission the utmost co-operation from the Chinese Government. The war, he said, had made it necessary to cut down many of the health activities which had just been started, but members of the staffs of the National Health Administration and Central Field Health Station were being assigned in large numbers to the anti-epidemic units, as was the personnel recruited from local health services. 'These persons, including health officers, bacteriologists and parasitologists, sanitary engineers, sanitary inspectors and technicians trained abroad and in our own training institute in Nanking during the past few years according to a programme in which both the League of Nations and the Rockefeller Foundation have taken such a great interest and given much support, will be at the full disposal of the commission. China's financial contribution towards the support of the units is already in the hands of the commission. You may rest assured that China will do her part in making the work a success.'

Subsequently the epidemic position in China was discussed, the future location of the league units was decided upon and the laboratory and other medical facilities already existing in the areas covered, transport, budgetary questions and details of the liaison to be established with the Chinese Government, were all considered. In pursuance of the decision taken, no. 1 Unit went by rail through Hankow to Sian-Fu, capital of Shensi, no. 2 Unit to Changsha, capital of Hunan, and no. 3 Unit to Nanning, capital of Kwangsi, and to Canton.

Early in February all three units had reached their stations, established headquarters and were engaged in making the necessary official contacts. At the same time the equipment and stores had arrived at the headquarters of each unit, apart from the base reserve stock which is to be retained at Hong Kong and upon which the units can draw as required. Transport was

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provided in the first instance by touring cars purchased in Hong Kong and later by motor lorries, ten of which are attached to each unit. A launch and two out-board engines for attachment to junks were also purchased. Thus in each area is now established an efficient health unit provided with disinfecting material, transport and equipment in each case for one stationary and two mobile bacteriological laboratories.

All the reports received so far emphasize the close liaison that exists between the league units and both the Central and Provincial Governments. In each case the league unit, with the necessary Chinese medical and auxiliary staff, is incorporated in the local health administration, and at the same time is in close touch with the Central Government through a special Chinese liaison officer. In this collaboration every effort is being made to meet present emergencies, and also to strengthen, and where necessary establish, permanent health work, particularly in rural districts. It is hoped that in this way the present league assistance to China will not simply be of a temporary nature, but will serve to continue the medical assistance given prior to hostilities, and thus be a permanent contribution to China's welfare. Moreover, the reports stress the great increase, both amongst the local and central authorities, of interest in anti-epidemic work which has followed the arrival of the league units.

The activities of the league anti-epidemic units were in this way incorporated in the Chinese Government's nation-wide effort to meet the emergency.

Thus a new medical school with a school for sanitary auxiliary personnel has been organized by the Chinese Government in Kweiyang for five hundred medical students and the training of five hundred auxiliary personnel. The central hospital and national field health station established at Nanking by the Chinese Government as part of its plan of technical co-operation with the league in public health matters were badly damaged by Japanese air raids. The new medical school is meant to afford an opportunity to those whose studies were interrupted by military operations, to continue and complete them. The students at the new medical school have been enrolled in teams which are always ready to join in field and hospital work as and when they are needed.

The training institutes for health workers and for workers in rural reconstruction have been transferred from Nanking and Tsining respectively to Kweiyang (Province of Kweichow) and several hundreds of students have been admitted to prepare them for field work during and after the war.

A hundred medical units are being organized to serve in rural districts, both in a teaching and in a working capacity. They are part of the mass education movement which was instituted in the Province of Hunan and has since been extended to Kweichow, Kwantung, Kiangsi, Szechwan and Kwangsi. This movement is attempting to apply the principle that China's national resistance, to be effective, must be backed by a well-informed and well-organized civilian population, able intelligently to co-operate with the army. The movement is enlisting students, teachers, scholars, doctors and technicians for all kinds of social, educational and propaganda activities, as well as for public health work, and is intended not only to help in meeting the present emergency, but to pave the way for post-war reconstruction. Anti-epidemic and sanitary measures are an important part of this movement. The staff of the epidemic commission of the League are actively taking part in this campaign.

The Chinese Red Cross has since December 1937 organized forty units, each consisting of doctors, nurses and dressers, to help in the care of wounded and refugees, as well as in preventive work.

The Chinese Government has organized three big anti-epidemic units, each consisting of from 150 to 250 doctors, nurses, sanitary engineers, sanitary inspectors, etc., to deal with epidemic problems in the Northern, Central and Southern areas of the country respectively. The three League of Nations medical units in these areas are co-operating closely with the Government organizations, as well as with the local authorities. National Government has also granted 160,000 dollars to the League of Nations' Epidemic Commission for its preventive activities.

The task of each unit after its arrival in its area has been, first, to establish contact with the local health administration, and, secondly, to survey closely not only local epidemic conditions, but also the existing machinery for controlling them. While this is being done, anti-smallpox and anti-cholera vaccination is being carried out and preparations made for the production of typhus vaccine and calf lymph locally.

Meanwhile the purchase of stores for the base supply was completed in Europe and supplies despatched to Hong Kong. These include large quantities of drugs required for the combating of the epidemic feared during the summer. In addition, the stores sent include one and a half tons of quinine, supplies of tetanus and diphtheria antitoxin (the gift of the Danish Red Cross), smallpox lymph, dried milk, cod-liver oil, etc.

DR. H. DE SA SILVER JUBILEE PRIZE

THE Bombay Obstetric and Gynæcological Society has selected the following subject for the thesis for Dr. H. De Sa Silver Jubilee Prize for 1938–39:—

'MEASURES FOR REDUCING THE INFANT MORTALITY'

The prize is open to all registered practitioners of five years' standing. The value of the prize is Rs. 125 in cash. The thesis must be submitted by 15th March, 1939. For further particulars, communications be made to Honorary Secretary of the Society, Sandhurst Road, Bombay, 4.

THE 47TH CHEMISTS' EXHIBITION, LONDON, ENGLAND

THE 47th Chemists' Exhibition will be held from 19th to 23rd September next in the Royal Albert Hall. The management, 'The British and Colonial Pharmacist', is always pleased to welcome members of the drug trade from overseas and they are admitted on presentation of a business card. Solely for the trade, it reflects the advance in the previous 12 months.

THE BIRTH CONTROL RESEARCH COMMITTEE OF VILE PARLE

THE Secretary of the Birth Control Research Committee of Vile Parle informs us that the number of people who visited and sought advice at the Birth Control Centre at 166A, Vincent Road, Dadar, Bombay, conducted by the Birth Control Research Committee of Vile Parle, during the quarter ending 15th June, 1938, was 290 out of which 112 were males and 178 were females. The total number from the first being 565.

SUMMARY OF TUBERCULOSIS NEWS FOR THE MONTH OF JUNE, 1938

1. *Hassan Masud Suhrawardy Memorial Anti-Tuberculosis Challenge Shield*

THE King George Thanksgiving (Anti-Tuberculosis) Fund annually awards the Hassan Masud Suhrawardy Memorial Anti-Tuberculosis Challenge Shield to the Municipal Corporation, Council or Committee or any other organization (approved by the Central Fund Committee) doing anti-tuberculosis work in British India or in an Indian State. There were nine entries this year from Ahmedabad, Bareilly, Bengal, Bombay, Delhi (2), Mysore, Sholapur and Surat. The fund committee at its meeting held on the 23rd May, 1938, awarded the shield to the Delhi Municipality for its commendable anti-tuberculosis efforts in 1937.

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The Delhi Municipality organized anti-tuberculosis campaign through the Public Health Department and through special tuberculosis institutions. It maintains a tuberculosis clinic and 92 beds in the Silver Jubilee Tuberculosis Hospital and helps the Ramakrishna Mission Tuberculosis Clinic with a donation. The work was started in 1936 and in a short period it has made good progress. The total scheme costs the Municipality Rs. 95,000 a year.

The anti-tuberculosis activities are many-sided and are well co-ordinated through the Public Health Department, which is in charge of the educative part of the work. The tuberculosis clinic is the centre of preventive work wherefrom education and propaganda in the homes of tuberculosis patients are carried out through the health visitors. The work of the anti-tuberculosis sub-committee of the local Red Cross in the field of education, health visiting and tracing of contacts with the help of twenty voluntary doctors is a commendable part of the joint effort from the clinic for a co-ordinated preventive work.

The housing schemes in Delhi under the Municipality and the Improvement Trust whereby some slums have been cleared, insanitary *bustees* removed and arrangements made for housing poor people in new areas are bound to have due effect in the anti-tuberculosis movement in this city.

2. *Jabli Sanatorium*

The Simla Hills are well known for tuberculosis sanatoria. The foundation-stone of a new sanatorium at Jabli was laid by the Raja Sahib of Baghat on the 12th June, 1938. Jabli is on the Kalka-Simla road near Dharampur.

3. *H. E. the Marchioness of Linlithgow's Appeal for the King-Emperor's Anti-Tuberculosis Fund*

The twelfth list of subscriptions issued by the honorary treasurer of the fund shows that money is steadily coming in and the collections now stand at Rs. 42,73,044-2-11. With Her Excellency at present in England, this Indian question has come prominently before the English public. A lecture was given recently at the Overseas-House, London, on 'Tuberculosis—A Key Problem in India', by Major-General Sir John Megaw. Her Excellency Lady Linlithgow was in the chair.

THE LEISHMAN MEMORIAL PRIZE

Lieutenant-Colonel E. V. Whitby, M.B., Royal Army Medical Corps, has been awarded the Leishman Memorial Prize for the year 1937, consisting of a silver medal and a sum of £30 (thirty pounds).

The Leishman Prize (Officers) is awarded annually to an officer of the Royal Army Medical Corps or the Army Dental Corps for work of outstanding merit.

NORTH PERSIAN FORCES MEMORIAL MEDAL

Edgar Cochrane, M.D., D.P.H., Medical Officer (Health), Gold Coast, has been awarded the North Persian Forces Memorial Medal for the year 1937 for his paper on 'Tuberculosis in the Tropics' published in the *Tropical Diseases Bulletin*, 1937, Vol. XXXIV, nos. 10 and 11.

The North Persian Forces Memorial Medal is awarded annually for the best paper on Tropical Medicine or Hygiene published in any journal during the preceding twelve months by a medical officer, of under twelve years' service, of the Royal Navy, Royal Army Medical Corps, Royal Air Force, Indian Medical Service, or of the Colonial Medical Service.

THE ALEXANDER MEMORIAL PRIZE

Major C. V. Macnamara, R.A.M.C., has been awarded the Alexander Memorial Prize for the year 1937 consisting of a gold medal and a sum of £40 (forty pounds).

The Alexander Memorial Prize is awarded annually to an officer of the Royal Army Medical Corps for professional work of outstanding merit.

TUBERCULOSIS NEWS FOR THE MONTH OF JULY 1938

(1) An anti-tuberculosis poster competition will be an important addition to the exhibition of the Simla Fine Arts Society to be held in September. The King George Thanksgiving (Anti-Tuberculosis) Fund has offered a prize of Rs. 100 for the most suitable poster exhibited to help the campaign against tuberculosis in India. If the best exhibit is not considered to be of sufficient merit, the adjudicating committee may divide or withhold the prize at its own discretion. The prize-winning poster or posters will become the property of the fund.

(2) The Bhowali Notified Area Committee has declared the town a 'non-tubercular' area. The public of Bhowali opposed this and the United Provinces Government has decided to appoint a commission under the Inspector-General of Civil Hospitals to enquire into the matter.

(3) A site for the Muzaffarpur tuberculosis clinic has been finally selected. In the meanwhile, a temporary clinic has been started at the Local Sadar Hospital.

Major-General Sir John Megaw, K.C.I.E., I.M.S. (Retd.), delivered a lecture on 'Tuberculosis—A Key Problem in India' at the meeting of the Overseas League on 12th June under the Chairmanship of Her Excellency the Marchioness of Linlithgow. Many eminent physicians, hygienists and administrators who had first-hand knowledge of the conditions in India attended, and spoke at the meeting.

Replanning of life from the point of view of health and saving of life was the dominating idea of Sir John's lecture. He asserted that the unit in every state was the family and prosperous states were those where each family lived a well-planned life. The head of each family must therefore be taught how to plan a satisfactory existence for those dependent on him, apart from the effort to change the public outlook without which better conditions of life were unattainable. The first essential, however, was to prepare a plan, which he suggested could only be done by the co-ordinated effort of those who have experience of agriculture, industry, economics, hygiene and education and the psychology of the Indian people. Once the plan was prepared we should adopt the methods of mass suggestion in promoting the welfare of the people. Sir John Megaw suggested that if one-fourth of the money spent on education was spent on instructions on life-planning, it would solve not only the problem of tuberculosis, but many others now in existence.

The campaign against tuberculosis must, however, include humanitarian effort and relief of the sick. Prevention and cure go hand in hand. Sanatoria and dispensaries have great educative values. The public will insist on having treatment and it is the business of the state to see that they get it. Tuberculosis is a key problem and its solution will mean more than the conquest of a single disease.

General Bradfield, Director-General, Indian Medical Service, while agreeing with the above views urged that one of the urgent necessities was a system of educative persuasion among the humbler classes, seeing that most of them prefer the cheap nostrums to be bought in the bazaar rather than the western medicines.

Major-General Sir Cuthbert Sprawson, I.M.S. (Retd.), endorsed the above views and considered that it was most important to educate the girls of India rather than boys and men, as it was the wives and mothers who allowed or vetoed what was done in a house in the way of medicine and hygiene.

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Current Topics

The Debt of Western Medicine to the East

By V. B. GREEN-ARMYTAGE, M.D., F.R.C.P., F.C.O.G.

(From the *Bristol Medico-Chirurgical Journal*, Vol. LIV, 1937, p. 239)

Little did I think when I entered the portals of the Royal Infirmary thirty-five years ago that I should have the honour of being invited to deliver a lecture to commemorate the name of Edward Long Fox, a man of noble character, fully imbued with that spirit of ceaseless inquiry which inspires youth.

Hitherto it has been the pride and fashion of scholars to ascribe to the ancient Greeks the glory of having first conveyed in their own language the foundations of medicine, philosophy and art; but recent research has shown that the genius of the Greeks drew its sap from Phœnicia and Crete, from Babylon and Egypt, and even still farther afield from Sumeria and the dwellers in the Valley of Indus. Indeed, it was from the East and not from Egypt that Greece derived her architecture, her medicine, her sculpture, her science, her philosophy, her mathematical knowledge—in a word, her intellectual stimulus.

This is no idle statement; for though the *Ebers papyrus* carries us back a thousand years before the birth of Christ, it is only within the last fifty years that the scientific world has realized that a high state of civilization existed in Sumeria and the Indus Valley five thousand years ago.

The discoveries of Evans in Crete, of Sir Leonard Woolley at Ur, and of Sir John Marshall in Mohenjo-daro and Taxilla have illuminated our darkness, and corrected many of our former 'certainties'.

It has been argued by some that such discoveries are but curiosities demonstrating manual dexterity and the stimulus of environment; but if we believe, as I do, that the history of medicine is the history of civilization, and if we have seen these things as I have seen them, we shall surely agree that the real criterion of their value lies in the extent to which these ancient peoples contributed to human progress, and to that culture which is the heritage of the living world.

Woolley has shown that the earliest graves at Ur, with their wonderful furniture and ornaments of gold and lapis lazuli, are older than the first dynasty of Egypt, four thousand years before Christ, and has stated that the foundation of Egyptian civilization was due to foreign influence; for in Egypt have been found the same cylinder seals, the same architecture, the same vases, the same grostesque animal drawings, the same musical instrument (the sistrum), and above all the same religious mythology as had been familiar to the Sumerians for hundreds, may be thousands, of years.

Nor must it be forgotten that Sumerian arms and Sumerian commerce, under the ægis of Sargon, spread up the valleys of the Tigris and Euphrates, penetrating Syria, Palestine and the Taurus, carrying with them their culture and their codes, the laws of Sumer becoming the code of Babylon, the code of Hammurabi that of Moses, the code of Moses that of Israel and Greece.

Neuburger sums up our knowledge as follows: 'Long before the time when Greece first appeared on the horizon of history the Babylonians were able with marvellous exactitude to undertake astronomical observations and calculations. Ideed, the style of writing, the pictorial and sculptural representation, the military tactics and jurisprudence of many nations were directly or indirectly influenced by Mesopotamia'.

The code of Hammurabi (2500 B.C.), engraved on Diorite stone, regulated medical and surgical practice. Details of operations and fees are given, but the punishment meted out for unsuccess daunted and discouraged all but the very expert, with the result that surgical progress was inhibited.

Recent discoveries by Dr. Frankfort of a seal of Indian workmanship depicting the elephant, rhinoceros and fish-eating crocodile in Tell Asmar, and by Woolley, of decorated Carnelian beads and steatite vessels exactly resembling those found by Marshall in Mohenjodaro, also point strongly to the fact that so long ago as 3000 B.C. facilities of trade existed between the people of Mesopotamia and the Indus Valley. It is more than likely that the long land route was traversed, but on the other hand it is possible that the sea route was used then, as it is now, by dhows sailing from the western ports of India, hugging the shores of inhospitable Baluchistan before reaching the Persian Gulf or Aden.

In this connection it is not without interest to observe that Sir Aurel Stein has shown that the population of Baluchistan and the Indus Valley was far greater then than it is now, for in that age the climate was good. That the people of the Indus Valley traded with the whole of India, Mesopotamia and Egypt is certain; for in the ruins of their cities we find jadeite from Central Asia, Amazon stone from the Nilgiris, gold from the Deccan, lapis lazuli and silver from Afghanistan, pearls and precious stones from Ceylon.

In those early days, though the art of writing was known, it is important to bear in mind that lack of suitable writing material made any lengthy compilation a difficult task; but modern study of folk-lore readily explains how experience, practice and learning were conveyed from mouth to mouth by the nomadic clans as they travelled along the great trade routes which stretched from India to Persia, Mesopotamia, Syria and Egypt. Those who have served in Sindh or Persia can readily visualize those long, winding caravans of mules and camels toiling and grunting along, those caravans referred to in the Books of Esther and Ezekiel carrying 'ivory and ebony', 'cassia and calamus', 'broidered work and rich apparel' from India to the West. Is it then difficult to picture the elders of these nomads, halted at the hour of the setting sun by riverside or hamlet, telling and retelling of those wonderous things they have seen and heard? Among these assuredly the prevention and treatment of sickness must have had a foremost place.

This is no fanciful image; for medical evolution among the Chaldeans and Babylonians began some six thousand years ago, whereas among the Greeks and Romans it started some three thousand years later. The papyri of the Egyptians, the clay tablets of the Assyrians, and the Vedas of the Indians represent but an epitome of their medical achievement.

It is true that these demonstrate a sacerdotal and theurgical system of medicine, for they possessed many gods, good and evil, male and female, causing or curing disease, the ancients believing that the gods rewarded or punished man for his various acts, reward being in the form of good health and success, punishment in the form of sickness or failure.

The practitioner of medicine, whether priest or layman, was always a man of good family and education. Doubtless superstition and custom marred the palatability of his simples, but ample record exists of the variety of drugs that were in common use for everyday disorders. We read of alum, antimony, arsenic, cantharides, copper, myrrh, turpentine, mercury, iron, zinc, sulphur and fish-liver oil being employed for diseases of the eye and skin. Nor must we forget that by long observance the ancients arrived at deductions of astounding empirical value. Many of these were handed down from generation to generation. Some were observed by the Israelites, as close study of the Old Testament will show; but perhaps the most astonishing, apart from the subject of personal hygiene and preventive medicine, is the law decreeing that man and wife shall live apart until the seventh day after the catamenial period has ceased if the people would multiply as the sands of the seashore. This empirical edict, based upon rabbinical observation, anticipates by four thousand years the recent discovery

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that ovulation does not occur before the thirteenth day, and perhaps also accounts for the well-authenticated fact that the orthodox Jewess does not suffer from cancer of the cervix uteri.

The Old Testament, mostly dating from eighteen hundred to five hundred years before Christ, has many references which demonstrate astute clinical observation and training. For instance, we read in Genesis xxxviii. 27 of spontaneous evolution with live uniovular twins and a ruptured amniotic sac. The treatment practised is classical and has not altered since. The condition described is very rare, only forty-four cases being on record. It was first mentioned in our medical literature by Viardel in the seventeenth century, who stated that when twins are of the same sex they are enclosed in a single amnion, whereas when they are of different sexes the Almighty encloses them in separate sacs with a view, shall we say, to guarding their morals *in utero!* Then again we have recognized the extreme dangers of uterine inertia in 2 Kings xix. 3 and in Jeremiah xv. 19, together with the fatality associated with precipitate labour and inversion of postpartum hæmorrhage in 1 Samuel iv. 19. I hope some of you will refer to these passages. But perhaps most wonderful of all is the graphic description (far antedating Hippocrates) of puerperal or pelvic peritonitis in Numbers v. 21-27.

Obstructed midwifery has little or no mention, but that is what one would perhaps expect in a nomad people living a healthy life and feeding on a full vitamin diet. The words 'the obstetric hand shall bring forth the winding serpent', in Job xxvi. 13, would, however, seem to hint at version or manual removal of the placenta.

Remember always that the treatment of disease in Biblical times was not *only* by prayer and sacrifice, for dietetic measures and medicaments were used, including healing springs and oil baths. Oil, wine and balsam were employed in dressing wounds, and bandages were applied to broken limbs. Midwives were obviously esteemed, for we read that 'the Lord dealt well with the midwives and built them houses'.

Though the priests or Levites were health officers, it is wrong to suppose that no professional physicians existed; for wherever there is mention of healing there is no reference to priests, but rather to the 'Rophe' or physician. It will be recalled that Jeremiah held it as inconceivable that there should be no physicians in Gilead, and of course the testimony of Ecclesiasticus xxxviii. stands for all times.

The Talmud gives much useful information, and shows considerable knowledge of the dura and arachnoid membranes. The preparation of food from slaughtered animals gave the Jews insight into the pathology of diseases of the liver, lung, kidneys, etc. Moreover, we read that trephining, amputation and venesection were regularly performed.

It would be indeed erroneous to minimize the medical achievements of the Babylonians and Israelites twenty to thirty centuries before Christ merely because we possess no doctrinal evidence. Admittedly magic, astrology and divination befog the written word but there can be no question that the practice of embalming, together with clinical observation, advanced the knowledge of anatomy, physiology and surgery, so that succeeding generations of Greeks and Romans could build upon it, assisted by speculative philosophy and deductive observation. Should such a statement be challenged one has only to contemplate that masterpiece of Assyrian art, the dying lioness from the palace of Assurbanipal which is in the British Museum. The wounded beast, her spine severed by an arrow, turns snarling on the hunters, dragging her paralyzed limbs. Such a conception could only be depicted by an artist fully acquainted with the physiological effects of spinal injuries.

It is not possible to date the dawn of Indian civilization, but it is probable that the Aryan race, fair in complexion and enterprising in character, originated in the high tableland eastward of the Caspian Sea. That they possessed a co-ordinate system of government and a religion abounding in moral precepts is certain. As their numbers increased and expansion became necessary one branch spread westwards towards Persia and the Caucasus, the other spread south-eastwards, invading and settling in a country called Aryavarta (the land of the Aryans), which lay east of the River Sindha, the western boundary of India. The letters H and S are convertible in Zend, the ancient Persian language, and so the name of the River Sindha explains the title given by those who first passed its boundaries —the Hindus.

The Book of Kings in our Old Testament speaks of the wisdom of a people who inhabited the east of Asia, and in Genesis xxxvii. 25 we read of the products which were in demand from them. Moreover, we are told that Terah, the father of Abraham, who lived about 1800 B.C., 'dwelt on the other side of the flood and served other gods', the flood, of course, denoting the great Euphrates River.

The Aryan race, possessing both an alphabet and grammar, were the founders of Sanskrit, the purest and most perfect of all languages, from which Zend, Armenian, Greek, Latin, German and Celtic derive their basic origin.

At this point it is not without interest, perhaps, to observe that all the early religions, those of Brahma, the Buddha, Confucius, Mahomet and Christ, together with almost all early civilizations, such as those of Sumeria, Northern India, Babylon, Egypt, Crete and Greece, flourished round about the thirty-fifth degree of latitude; that is to say, where the resources of nature were most abundant and the climate not too enervating.

It has been supposed by some that China can claim priority in knowledge of the arts and sciences owing to the remarkable and enduring character of their civilization, but although there was intimate intercourse with India by means of travellers, ambassadors and Buddhist priests, it is now held that the science of medicine was not introduced into China before the Christian era, for reverence of the dead and ancestor worship forbade dissection. The only medical debt we consciously owe to the Chinese is gold and silver acupuncture, which was immemorial treatment for every ill; though it would be churlish not to admit that they first discovered the art of making paper, an art that later made the intellectual revival of Europe possible.

It is from the Vedas, through the mists of mythology and fogs of superstition, that fifteen hundred years before Christ we can discern the realities of existence in ancient Hindustan. Legend has it that the great god Brahma wrote the Vedas for the guidance of the universe, and that the greatest of these was the Atharva Veda. Subsequently, taking compassion upon sick and suffering man, Brahma produced the Ayur Veda, which is the first great treatise on the Science of Life. Dhanwantari, the father of medicine, was then created to minister to the diseases of mankind, and just as the sages came in later centuries to Hippocrates, so in those early days deputations were sent to Dhanwantari for instruction. The story runs that on their arrival the master asked his pupils, 'On what shall I lecture?' and they answered, 'On surgery, because among the gods there are no diseases, whereas wounds and injuries are the common lot of gods and men'. This reply, so like the story in Homer of Achilles and Machaon, is not without interest, for even to-day many incline to look upon disease in mankind as a retribution for sin.

Susruta and Charaka were among the first disciples of the master, and though some are of the opinion that their Sanskrit compilations belong to the Christian era, it is far more probable that they are pre-Hippocratian, for their elaborate ethical code, written in ancient and purest Sanskrit, was founded on the Laws of Manu, and is purely Brahmanical. These laws date back to 900 B.C. Moreover, a study of their copious Materia Medica reveals the fact that there is not a single mention of any substance of foreign source, whereas the writings of Hippocrates give ample

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evidence that many Indian plants, whose properties were well known, were imported into Greece.

The Hippocratic oath leads one to the same conclusion, for when it interdicts the performance of lithotomy, except by men who were special practitioners of this operation, it surely suggests that the author's knowledge of anatomy and surgery had been derived from a more enlightened nation, and was imperfect compared with that of his teachers. Moreover, seeing that Hippocrates visited Smyrna, Libya and Scythia, is it not probable that he visited this latter distant and inhospitable northern country because he had heard of the surgical feats performed by an enlightened people?

Dim dates are difficult to be sure of, but at least we know that at the time of India's invasion by Alexander the Great the conqueror enlisted the services of local practitioners, whose wisdom was as proverbial then as it was in the later days of Galen, Pliny and Dioscorides, who frequently when wishing to imply excellence or wisdom used the words *Indi dixerunt*.

Susruta taught that the foundation of surgery was anatomy, and made his pupils do dissections. In those days there was no Brahmin ban against touching a corpse, for the Laws of Manu state that 'mere bathing will purify after touching a dead body, while to stroke a cow or gaze at the sun if the mouth be sprinkled with water will remove defilement'.

Thus began the golden age of Hindu surgery. To Susruta we owe the discovery of cataract-couching, skin-grafting and rhinoplasty. From him we possess a precise knowledge of midwifery and learn the positions occupied by the fœtus *in utero*. He states that the expectant mother must be kept in a happy frame of mind and in placid surroundings if her labour is to be easy. He speaks of post-mortem Cæsarean section. He writes of amputations and the necessity of artificial limbs made of iron. Tumours are removed, ruptures reduced and patients cut for stone. Still more remarkable, rules are laid down for the operating-room, for it is written that it should be fumigated with sweet vapours, the surgeon is to keep his hair and beard short, his nails clean and wear a sweet-smelling dress. It is not certain what drug was used, but directions are given that the patient was to inhale a substance called *sammohini* before operation. Over a hundred steel instruments are depicted and their uses described. Many of these have their counterparts in the catalogues of every modern firm supplying the needs of the general surgeon.

Reference having been made to the fact that Cæsarean section is mentioned by Susruta, perhaps a digression may be permitted in order to show that this operation is of great antiquity, indeed dating back to the Iliad of Homer; for the legend runs that Coronis, mother of the unborn Aesculapius, was killed by Artemis for her infidelity. When Apollo, the father of her child, saw Coronis on the funeral pyre, he cut the boy from his mother's womb and carried him to the cave of the wise centaur Chiron, where he was instructed in the cure of all disease.

Ovid, *Metamorphoses* ii. 630, obviously refers to this belief in the lines:—

'Natum flammis uteroque parentis .
Eripuit geminique telit Chironis in antrum.'

And, of course, we have the evidence of Shakespeare that the operation was well known in his day, for apart from the reference in *Macbeth* to 'Macduff who was from his mother's womb untimely ripped' we have the metaphor in *King John*, V. iii., indicating that his audience was well acquainted with the operation.

'You bloody Neros, ripping up the womb,
of your dear Mother England, blush for shame.'

There can be no question that the practice of Cæsarean section dates back to the Vedas, for to-day, as from times immemorial, the Hindu is forbidden to burn the body of a pregnant woman who dies before the birth of the child without first excising the fœtus.

Needless to say such evisceration must have taught the elements of anatomy; for the most frequent cause of premature death in the case of pregnant woman in the Tropics must have been the same then as now, namely either enormous enlargement of the spleen and liver inhibiting progressive ascent of the uterus or obstruction in the pelvis preventing delivery.

Charaka flourished about 400 B.C. and wrote eight books. He describes fevers, leprosy, mania, epilepsy, and nearly every disease we meet with in common practice to-day. The seventh book details four hundred purgatives alone and their various uses. He classifies food and diet according to disease, and tries, like Freud, to analyse the secret of dreams. He writes of the benefit of steam baths and of stramonium cigarette smoking for asthma. He advocates nux vomica for paralysis and dyspepsia. There is an interesting section on climatology, where patients, according to their sufferings, are urged to sojourn in such climates as are suitable to them. The ritual of oral cleanliness is looked upon as of the first importance, and although toothbrushes did not come into use in Europe until about A.D. 1700, it is remarkable to read the rules laid down by Charaka for the selection and use of twelve distinct types of toothbrush and tooth powder.

He tells us that the practitioner who knows the value of quicksilver and the metals is a god, he who knows the qualities of herbs and roots is a man, he who knows the use of the knife or fire resembles a devil, but he who knows the proper prayers to be offered up in the time of sickness is a prophet.

The mention of the metals is of significance, for the ancient Hindu race were the first to employ mineral drugs internally. Their chemical skill was remarkable. They knew how to prepare sulphuric, nitric and hydrochloric acid. Gold, mercury, silver, copper, lead, tin, zinc, iron, arsenic and antimony are all described, and their uses, either in pure form or as salts, are indicated. For instance, it is illuminating to read that if sixteen parts of gold and one of lead be mixed with lemon juice and then rubbed together and heated, or if gold be mixed with sulphur and aloes and exposed to the fire twelve times until it is reduced to a powder, either mixture is valuable for chronic diseases of the spleen and lung. Or, again, it is instructive to read of the preparation of the yellow sulphurate of arsenic, which was used for leprosy, skin diseases, mania and fevers.

It would take too long to recount the way they prescribed their medicines in pill, extract, infusion or ointment form, with rules which varied according to the temper, age, constitution and disease of the patient, but historically it is perhaps not without interest to see that medicines were divided into classes, one which increased strength by evacuating bad humours from the body, such as purgatives and emetics, and the other which lowered the exalted action of the humours and restored them to a healthy state. For instance, thirty-nine simple drugs are enumerated for curing diseased wind, twenty-three for curing diseased phlegm and twenty for deranged bile. In those days rubbing with oil to relax all tissues of the body was an essential feature of treatment before any drugs were exhibited.

In parenthesis and lighter mood it may not be without interest to the gentler sex to relate that the art of dyeing the hair, the fashion of lipstick and eye pencilling, the mode of varnishing the finger and toe nails, together with the music of the bagpipes, all originated in Sumeria and the north-west corner of India some five thousand years ago—imperishable legacies to many.

If such was the wisdom of Aryan India (and I have but given you a passing glimpse of it), what was the reason of its decay? History tells us that it was the rise of pure Brahmanism with the desire of the priests to maintain all power in their own hands. For it must be remembered that the Brahmins, with their subcaste the Vaidyas, considered themselves persons of divine origin, whose duty it was to perform rites of religion and instruct mankind in the path of learning and duty. They alone had access to the Shastra, and so became learned pundits and skilful physicians.

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The priestly office, like that of the ancient Druids, was the road to distinction and power. In the beginning they attained pre-eminence by cultivation of the mind and the practice of virtue, but with power came degeneracy. The despotism of caste, forbidding liberty of thought, laid down rules which subjected a whole continent; for we see that in order to curtail the growing influence of the surgeon they not only prohibited all shedding of blood, but ruled that all who took from or were touched by a surgeon became unclean, and to enhance their own majesty they introduced the treatment of all diseases by *mantras*, incantations and amulets.

The rise of Buddhism and its rapid spread throughout the Far East still further inhibited surgical progress for hundreds of years, for the teaching of the Buddha prohibited the use of the knife and any form of dissection.

One must, however, be fair to the Buddhists, for to them India and the whole world owes a great debt from a sanitary, medical and veterinary point of view. They first established a system of state medicine, one physician being appointed for every ten villages on the great roads of India. They laid down laws regulating burial and sanitation. They prohibited adulteration of food. They established botanical gardens for the special supply of herbs and drugs for medical use. They built bird and animal sanctuaries and even animal hospitals with a reverence worthy of St. Francis of Assisi. Indeed, our debt to the followers of the Buddha is but little appreciated, and I would wish to offer them a professional salute.

It is not easy for the Western mind to enter into that spirit of Buddhist or Hindu philosophy, which deprecates action, for, as Carlyle has said, 'the end of man is an action and not a thought, though it were the noblest'.

The Yogi who practises Yoga with the object of uniting his soul with the divine spirit is highly interesting as an example of the attitude of the Indian mind towards life. His world-weariness causes him to fly from the struggle and pleasures of life to the solitude of the jungle, in order to seek an escape from the activity even of thought itself.

It may be that a philosophy of quietism was natural to the indolence and enervation of Indian life, but such a doctrine was a direct incentive to warlike and materialistic neighbours to harass and invade the country; and so we find that all the learning of centuries subsided, was lost or forgotten in the tides of war and invasion which swept again and again over India from the beginning of the Christian era.

Is it then surprising that the clocks of medicine and of surgery stood still, and that Europeans visiting Hindustan at the time of Shah Jehan marvelled at the lack of any surgical skill? Their wonder is perhaps not so remarkable when one considers that the doctrine of Karma held two hundred million people, a doctrine that taught that 'I am what I am because of my past deeds, I shall be what I shall be because of my present deeds'.

So far it has been my object to portray the intellectual vigour of the primitive eastern branch of Aryans, to whom we owe so much in medicine, law, art and philosophy. It is not my intention to dwell upon that later western branch which built up the Grecian and Roman systems of medicine from the time of Pythagoras till the second century A.D. During this period men of genius conferred glory on their country and imperishable renown upon themselves. Greece became the seat of philosophy, and Greeks the nursemaids of the arts handed down to them by earlier eastern civilizations. But as in India so too in Greece, the clock of progress was stopped by the invasion of rude and hardy races from the north, who destroyed what was most noble and beautiful with relentless barbarism, preserving only what harmonized with their rude manners or administered to their sensual pleasures. Thus persecuted, Europe remained for many centuries in a state of lethargy, the pendulum of learning swinging back again towards Egypt and Syria.

It is to the Caliphs of Baghdad that we owe an imperishable debt. They patronized learning and instigated the translation into Arabic of the most important medical authors, particularly those of Hippocrates, Dioscorides, Galen and Paul of Aegina. This inheritance of Grecian thought awakened the dormant intelligence of the Arabs and sharpened their critical faculties. The Nestorian school at Jondisabur was the cradle of Arabic medicine. From it came wise men who gave the impetus to translation and scientific research which lasted for centuries. To fulfil this statement it is only necessary to mention three great names, Rhazes, Ali Abbas and Avicenna.

Rhazes was born in 850 A.D. He was guided by the principles of Hippocrates, basing his opinions upon observation and laying stress upon hygienic and dietetic measures. He has acquired lasting fame chiefly for his vivid description of smallpox and measles.

Ali Abbas realized that the chief task of the physician was to prevent disease. He was a pioneer in recommending that young physicians should frequent the mental and other hospitals which were first inaugurated by and were the glory of Arabic civilization from Baghdad to Alexandria and from Cairo to Cordova.

Avicenna, who wrote the *Canon of Medicine*, stands out as a monumental figure from the tenth to the fifteenth century. He was a statesman, physician, astronomer, teacher and author. His great work is a landmark, for it stands as an epitome of all precedent development, the final codification of all Græco-Arabic medicine.

For nearly a thousand years Arabic physicians were the teachers of the West, throwing open to the Christians of Europe the portals of scientific medicine and granting to them the privilege of access to the intellectual treasures of antiquity, a privilege of surpassing importance which compels recognition.

With the Renaissance individuals and nations vied with each other in honouring the pursuit of learning. The study of medicine exercised the genius of great men, who constructed it upon a basis of anatomy and physiology, observation and reasoning, not a little assisted by the genius of Leonardo da Vinci, who uplifted the science of descriptive and pictorial anatomy to a height which has never been equalled.

Coming to more modern times, it is very easy to see and appreciate the debt of the West to the East, for civilization, commerce, transport, peace and war, owe an imperishable debt to scientists working under conditions of danger and stress.

If the apothegm of Blaise Pascal, 'Had the nose of Cleopatra been shorter, the whole face of the earth would have been changed', be accepted, how much more truly could it be written, 'Had the cause and treatment of malaria been known, to what heights would not Greek and Roman culture have reached'.

History teaches us that Hippocrates recognized the periodicity of malaria and relapsing fever, for he describes the jaundice, the enlarged spleen and liability to abortion; but it was the tide and pride of wars, with overcrowding of populations in infected areas, that spelt the ultimate decay of Greece and Rome.

The story of Ronald Ross working in Calcutta before the days of modern comforts and modern scientific implements is a romance in itself. It is quite impossible to estimate the benefits that his discoveries and those of Manson have conferred upon mankind—discoveries that have made possible the development of all tropical countries, and which have reduced the death rate of immigrants and indigenous people in those countries to that of London.

Similarly peace and war have demonstrated the debt we owe to the experimental research of Shiga and Leonard Rogers on the treatment of dysentery and cholera; to the work of Obermeyer, Todd and Mackie on the transmission of relapsing fever; to the discoveries by the Japanese investigators Inada and Ido of the leptospiræ which cause Weil's disease; to the researches of British, Dutch, German and Indian

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workers on the causation of beri-beri and epidemic dropsy; to the work of McCarrison on goitre and nutrition; to the finding by Bilharz of the parasite which, since time immemorial, has been the cause of colossal mortality and invalidism; to the investigations of Scott, Fairley and Mackie on the ætiology of sprue, that disease which so often in former days was fatal; to the work of Leishman and Donovan upon kala-azar; and to the elucidation of that crippling disease osteomalacia by Maxwell, Stapleton and others. It is not necessary to prolong the list, for these are but a few of the diseases which every European practitioner may meet with in these days of rapid transit and moving populations.

Horace tells us that as we grow older we become *mitior et melior;* therefore, before closing, I should like to touch upon a somewhat sombre side of our debt, one that has a bearing upon the future. Hitherto I have endeavoured to demonstrate what we owe to the East, and have tried to illustrate how, in this century at least, we have repaid some of that debt in the currency of preventive medicine. But from that currency an imponderable problem is arising, namely, that of food production and supply, for a rapidly increasing eastern population with a rapidly decreasing death rate. The burden that preventive medicine has thrown upon the East is an immense one. It is a challenge, for starvation and ultimate decay must occur if food production is inadequate in those countries. It is for us to devise a plan lest the debt of eastern medicine to the West be repaid by lamentation.

That science will solve the problem, too, we need not doubt. The productivity of Mother Earth is so great that even in a crowded Europe and America millions of tons of fresh foodstuffs are destroyed deliberately every year for purely economic reasons. 'Poverty amid Plenty' is a commonplace all the world over. But it is a problem which we must solve quickly, especially in the East. If we can solve it, maybe our debt to those 'Wise Men of the East' of whom I have been speaking will be *at last* repaid in full.

High Calorie Feeding in Gastric and Duodenal Ulcers

By L. J. WITTS, M.D., F.R.C.P.

(From the *Medical Press and Circular,* Vol. CXCVI. 23rd March, 1938, p. 240)

WE already know much about the ætiology of gastric and duodenal ulcers, and our difficulty is to put our knowledge into practice. We know that they occur only in the presence of acid gastric juice. We know that emotional disturbances such as loss of financial or domestic security can precipitate an attack or a recrudescence of peptic ulceration. Ulcers are common in intense people who overwork and have too much drive. They are infrequent in primitive peoples who do not take much thought for the morrow and who live simple lives in which emotions are vivid but transient, unashamedly expressed and quickly forgotten. Diet has a more obvious influence on the location than on the frequency of peptic ulcers, gastric ulcers being more common in those on coarse diets and duodenal ulcers in those on refined diets. Nevertheless, whenever we see a secular variation in the incidence of a disease we are always tempted to ascribe it to change in diet, and the rise of peptic ulcer as a cause of illness and death in Western Europe can be fairly closely correlated with a fall in the intake of vitamin B. McCarrison has produced gastric ulcer in animals by feeding them on a diet in carbohydrate and deficient in vitamin B, and more recently an anti-hæmorrhagic factor K has been found in foods, which is often closely associated with vitamin B and absence of which may lead to erosions in the alimentary mucosa. For the present there is no proof that peptic ulcers are due to defects in diet, but there is much to suggest that healing may be delayed by lack of essential food principles.

One of the few certain facts about peptic ulcers is that they only occur in the presence of acid gastric juice. They are confined to surfaces which are exposed to concentrated gastric juice, such as the lower end of the œsophagus, the stomach and the first part of the duodenum, and they never occur in pernicious anæmia, a disease which is characterized by gastric anacidity. Experimentally, ulcers can be produced by methods which abolish the natural dilution or neutralization of the gastric juice or which expose the mucosa to a constant drip of dilute hydrochloric acid of a strength comparable with that of normal juice. It is natural to conclude that the healing of ulcers will be promoted by measures designed to neutralize the gastric juice, provided that the diet is not irritating and any drugs used do not themselves damage the mucous membrance. This is the basis of the Sippy treatment, which is still the most rational and most successful medical treatment. Sippy's diet was based on the fact that milk neutralizes approximately its own volume of gastric juice and that fats inhibit the secretion. The normal quantity of gastric juice is 1.5 to 3 litres a day. Fifty ounces of milk will neutralize 1.5 litres of juice. In addition one can give up to 20 grammes a day of alkali (expressed as sodium bicarbonate), the equivalent of 3 litres of juice.

'Three ounces of a mixture of equal parts of milk and cream are given every hour from 7 a.m. until 7 p.m. After two or three days soft eggs and well-cooked cereals are gradually added, until at the end of about ten days the patient is receiving approximately the following nourishment: three ounces of the milk and cream mixture every hour from 7 a.m. until 7 p.m. and in addition three soft eggs, one at a time, and nine ounces of a cereal, three ounces at one feeding, may be given each day. The cereal is measured after it is prepared.

'Cream soups of various kinds, vegetable purées and other soft foods may be substituted now and then, as desired. The total bulk at any one feeding while food is taken every hour should not exceed six ounces. Many of the feedings will not equal that quantity. The patient should be weighed. If desired, a sufficient quantity of food may be given to cause a gain of two or three pounds each week.

'A large variety of soft and palatable foods may be used, such as jellies, marmalades, custards, creams, etc. The basis of the diet, however, should be milk, cream, eggs, cereals and vegetable purées. Lean meat is not given during the period of accurate observation, since it interferes with the tests for occult blood in the stool and aspirated stomach contents.

'The acidity is more easily controlled by feeding every hour and giving the alkalis midway between feedings. The acidity may, however, be controlled by feeding every two, three or four hours. I have maintained complete control of the free hydrochloric acidity in several cases by feeding three times daily. In most cases, however, the plan of feeding every hour is best.'

A tube was passed at bedtime and the stomach aspirated if more than 10 c.cm. of juice were present. The tube was also passed occasionally at different periods of the day to ensure that neutralization was complete. It is important to note that Sippy's diet was much more generous than many of the modifications which have been suggested. Sippy fed his patients every hour and he expected them to gain weight. If one feeds a patient with watered milk every two hours, one may save work for the nursing staff and expense for the hospital, but one cannot expect to get the same results as Sippy. If feeds are given two-hourly, especially if the milk is citrated, milk and alkali are rapidly evacuated from the stomach and the ulcer is exposed to undiluted juice. Even with the full Sippy regime complete neutralization is difficult and during the hours of sleep the stomach often secrets acid copiously, so that the healing accomplished during the day is broken down again at night.

Various efforts have been made to overcome these difficulties. Alkalis have been introduced which act slowly and which do not produce alkalosis, such as

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magnesium trisilicate and aluminium hydroxide. In the method adopted by Winkelstein, a tube is passed into the stomach and the patient is fed by continuous drip. The solution consists of milk containing 5 grammes of sodium bicarbonate to the quart. A flow of thirty drops a minute equals three quarts or 2,400 calories in the twenty-four hours. Such a solution will theoretically neutralize nine quarts of N/10 hydrochloric acid, but in our experience it has not always produced persistent anacidity, and ulcers have not healed appreciably more rapidly than under the Sippy regime. In hot weather the solution tends to clot and will not flow. Alkalosis may occur. The constant presence of the tube is an annoyance and one patient swallowed his completely, to his intense alarm. Similar objections apply to the continuous alkaline drip advocated by Woldman, and to the methods of duodenal feeding and jejunostomy. The more experience one has of peptic ulcer, the less one uses these elaborate methods. The quickest and safest way of bringing under control the symptoms of peptic ulcer is by hourly feedings during the day and a powerful barbiturate such as nembutal at night. Strong alkalis such as sodium bicarbonate and magnesium oxide should only be used—but they certainly should be used—to relieve pain. When strong alkalis are used the blood should be examined every 48 hours for evidence of alkalosis or uræmia. Weak alkalis such as magnesium trisilicate may be used to promote healing. Atropine and belladonna are rarely of assistance in relieving pain or hyperacidity. As soon as the patient is free from pain the diet should be increased to a level which is adequate in calories and vitamins and which enables him to regain lost weight. It usually does not take more than three days' treatment to reach this stage, and rarely more than a week. If the patient feels hungry between feeds it is probable that the diet is inadequate. Adequate feeding is especially important in preparing patients for operation, for operative mortality is directly proportional to the degree of malnutrition and loss of weight, and a patient who is 25 per cent below his best weight is a very bad operative risk. It is often better for a patient to go to a convalescent home before operation than afterwards.

The original Sippy diet is, in my opinion, far and away the best diet for the medical treatment of peptic ulcer and one can only deprecate modifications in which feedings are too widely spaced, calories inadequate or the diet excessively monotonous. The only real improvements in treatment are the recognition of the frequency and danger of alkaline poisoning and the need for supplementing the diet by added vitamins. The commonest cause of adult scurvy in this country is a gastric diet. Instead of the usual olive oil before some of the feeds I use cod-liver oil,

TABLE

Dietetic treatment of gastro-duodenal hæmorrhage
Arranged for two-hourly feeding

Feeds by day	Food			Day		
				1	2	3 and subsequent
1	Whole milk (fresh or dried)		oz.	5	5	5
	Patent barley or strained porridge			Portion	Portion	Portion
2	1 egg beaten up in milk		oz.	5	5	5
	Buttered rusks or cream crackers			..	1	2
3	Whole milk (fresh or dried)		oz.	5	5	5
	Marmite to taste		..	..	..	..
	Barley sugar		oz.	1	1	1
	Thin crustless white bread and butter ..		slices	..	1	2
4	Strained orange or tomato juice ..		oz.	1	1	1
	Vegetable purée		..	Portion	Portion	Portion
	Pudding		..	,,	,,	,,
	Cream		oz.	1	1	1
	Boiled or steamed fish		..	..	..	Portion
5	1 egg beaten up in milk		oz.	5	5	5
	Barley sugar		oz.	1	1	1
	Buttered rusks or cream crackers ..		..	..	1	2
6	Whole milk (fresh or dried)		oz.	5	5	5
	Fruit purée		..	Portion	Portion	Portion
	Pudding		..	,,	,,	,,
	Cream		oz.	..	1	1
	Thin crustless white bread and butter ..		slices	..	1	2
7	1 egg beaten up in milk		oz.	5	5	5
	Black treacle or barley sugar		oz.	1	1	1
	Buttered rusks or cream crackers ..		..	..	1	2
8	Whole milk (fresh or dried)		oz.	5	5	5
	Fruit purée		..	Portion	Portion	Portion
	Pudding		..	,,	,,	,,
Feeds at night (when awake).	1. Whole milk (fresh or dried) ..		oz.	5	5	5
	2. 1 egg beaten up in milk		oz.	5	5	5
Between feeds	Strained orange or tomato juice ..		oz.	1	1	1
Approximate caloric value			..	2,545	3,118	3,624

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which not only exercises the inhibiting action of fat on gastric secretion but also supplies vitamins A and D. Vitamin C is supplied as orange or tomato juice and B as Bemax and Marmite. Doctor and nurse or dietitian should take a keen interest in the patient's likes and dislikes. Patients who will not take milk in the ordinary way will often take milk soups, proprietary milk foods or milk flavoured with coffee, tea or chocolate. A visit to a milk-bar or an ice-cream counter will often suggest new ideas. The puréed vegetables sold by the canning companies under the titles of homogenized foods (Libby) and strained foods (Heinz) are very helpful, as also are many of the Heudebert foods. Patients on dietetic treatment often suffer from flatulence and dyspepsia which is quite different from their original ulcer pain; it is due to intolerance of the diet and can be relieved by modifying the milk, reducing fats, altering the type of purée or other simple expedients.

The recent great advance in the treatment of ulcer is the policy of immediate feeding in cases of hæmatemesis and makæna. The orthodox treatment in such cases has been starvation for 48 hours, then very small feeds at two-hourly intervals, so that on the tenth day of the illness the patient is receiving only 1,000 calories and he does not get 2,000 until the fifteenth day. These patients are starved not only of food, which might be tolerable, but of water and salts which is intolerable, owing to the large amounts of fluid lost in the hæmorrhage. For any but the most expert it is difficult to replace the water and salts by parenteral administration. Is it any wonder, then, that these patients are dehydrated and toxic, and that about 15 per cent of them die? The orthodox treatment is based on fallacies. One does not rest the stomach by starvation; one merely exposes the ulcer to the pangs of hunger and the action of undiluted gastric juice. Pultaceous food in the stomach does not excite bleeding but acts as a hæmostatic. In any event it would be futile to concentrate on treatment of the bleeding point when the organism is dying of shock and dehydration. The diet which I have now used in nearly fifty successive cases of hæmorrhage from gastro-duodenal ulceration without a death is as given in the table.

Between feeds sips of water, glucose solution, or half-strength isotonic saline are allowed in quantities up to 5 ounces an hour. If the patient is hungry he is allowed 5 ounces of milk at the intermediate hours. The total fluid intake averages about 2,750 c.cm., and allowing for the water of oxidation the patient is probably provided with some 3½ litres of fluid a day. No medication is given other than liquid paraffin or paraffin emulsion, and I deliberately avoid alkalis unless there is epigastric pain—which is, of course, unusual after a hæmatemesis. It is both safe and wise to give treatment with iron from the start. To avoid disturbing the patient or provoking fresh bleeding no purgatives are allowed and enemata are postponed until between the fifth and tenth days. I have described elsewhere how well this deliberate constipation is borne. Unless the patient is collapsed, when, of course, he should be transfused, I allow the head to be moderately raised, because the patient is more comfortable in this position than in the orthodox complete recumbency, and he can take food without swallowing troublesome quantities of air.

Looking back on this diet, which began as a modification of that of Meulengracht, who introduced the treatment of gastro-duodenal hæmorrhage by early feeding, I see I have come round to something very like the original Sippy regime. I have not wanted to change it at too early a stage of my experiments, but it departs in two ways from Sippy and I am not sure that these departures are not faults. The two-hourly feeds are quite alarmingly large, some of them from ten to twelve ounces, and the intermediate milk feeds are permissive and not compulsory. The more faint-hearted may decide that no feed should exceed six ounces, when hourly feeds will be necessary to keep up the calories. I am prepared to admit that not all my patients have been able to eat all the diet all the time, and when they have not wanted feeds they have not been pressed. I am quite certain that they have been much more comfortable and fitter than patients treated on orthodox lines. Recurrence of bleeding has not been considered an indication to stop treatment by feeding. The great thing is to feed ulcer patients; feed them especially when they have bled or before operation; feed them with a diet of which milk forms the basis; feed them frequently so that the stomach is never empty during the waking hours; and if the patient has pain, ask yourself if you could not feed him oftener.

Treatment of Gonorrhœa with Sulphanilamide: Comparisons with Oral Sulphanilamide, Vaccine and Manganese Butyrate in Males and Females

By K. LEIGH EVANS, M.P.H., L.R.C.P. & S.

(Abstracted from the *Medical Press and Circular*, Vol. CXCVI, 30th March, 1938, p. 269)

THE reports on the use of sulphanilamide in the treatment of gonococcal infections leave no doubt that this compound has the most important place in the routine of gonococcal treatment. The report of Dees and Colston gave results of 47 cases with a complete cessation of symptoms, and a disappearance of gonococci, within five days, in 36 of these cases; they record only three failures and three relapses. Crean is even more optimistic, recording only six failures and three relapses out of 100 cases; Anwyl-Davies, using a low dosage, does not consider the drug satisfactory; Cokkinis gives no exact figures but is enthusiastic about the value of sulphanilamide.

DOSAGES

The sulphanilamide preparation used throughout is p-Benzylamino Benzene Sulphonamide. At first treatment was commenced with a dose of 6 grammes per day. This was found to be too toxic for routine use on clinic patients and a lower standard dose was used. This was 4.5 grammes per day for the first five days, followed by 3 grammes per day for six days. The total treatment lasting for 11 days.

For irrigation a solution containing potassium permanganate 1 per cent, sodium carbonate 10 per cent, and sodium chloride 32 per cent is diluted in the proportion of 2 drachms to 20 ounces.

Douching is done at a level of not more than two feet above the pelvis with a warm solution of sodium bicarbonate 1 : 160. Tampons saturated with solutions of picric acid, mercurochrome and ichthyol in glycerine are changed on alternate days, or daily if the discharge is very profuse.

No prostatic massage or instrumentation was used on the cases treated with sulphanilamide.

The complications noted were prostatitis (very common), orchitis, epididymitis and arthritis. The duration of the disease varied from 24 hours to two years, 41 cases being seen within the first week of onset of the discharge.

Thus of 113 males treated with sulphanilamide 68, or 60 per cent, were clinically cured within two weeks of the commencement of treatment. A further 11 were clinically cured after a second course of sulphanilamide, making a total of 70 per cent well after sulphanilamide treatment. It appears to make little difference whether the sulphanilamide is used with other local or systemic treatment—in fact the best results were obtained when the compound was used alone, 19 well out of 24 in two weeks. In the whole series nine cases relapsed after all discharge had ceased, and two other cases developed epididymitis during treatment.

Of the 32 cases treated with manganese butyrate, alkaline mixture and irrigation (prostatic massage and instrumentation used when indicated) only 11 were clinically cured at the end of three weeks. The cases

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treated with gonococcal vaccine showed similar poor results—7 out of 18 in three weeks.

Laboratory tests for cure have been unsatisfactory as it has not been practicable to carry out the Complement-Fixation Test. The routine adopted has been: (*a*) provocative injection of 500 million gonococci; (*b*) 24 hours later massage of the urethra over a full-sized bougie, followed by (*c*) drinking of 72 ounces of beer; (*d*) 18 hours later the prostate is massaged and the urine deposit examined after centrifugalization at 1,500 revolutions per minute for five minutes. If there are any gonococci (intra or extracellularly), or if the deposit contains an average of more than five pus cells per high-power field, the patient is considered not cured. Only 25 of the patients treated with sulphanilamide have attended for this test for cure, of these 13 have been passed as cured. Some generally accepted standard of cure is an urgent necessity before the results of different observers can be considered comparable.

Females.—In each case there was a vaginal discharge in which the gonococcus was demonstrated. Almost all the 132 cases were of cervicitis and endocervicits; there were 10 cases of salpingitis. Other conditions present were urethritis, marked vaginitis, bartholinitis and endometritis. The duration of the disease ranged from one week to three years; there were no cases having a history of less than one week. Most of the cases gave a duration of one to six months. The majority of this group are prostitutes—either part or whole-time—and are very difficult to keep under observation.

Of the 101 females treated with sulphanilamide 49 were clinically cured within two weeks of the commencement of treatment; a further 17 were free of all signs or symptoms after a second course of sulphanilamide—a total of 66 out of 101 in four weeks of treatment with this compound. Here, as in the series of male patients, it appears to make little difference whether the sulphanilamide is used as the only treatment or with local or other systemic methods. The improvement, in cases responding to the drug, has been remarkable and rapid—salpingitis most rapidly, cervicitis and endocervicitis clearing within a fortnight. There were ten relapses reported among the women treated with sulphanilamide, whilst they were still undergoing treatment. Treatment with manganese butyrate, or gonococcal vaccine, combined with local treatment gives poor results when compared to sulphanilamide therapy.

In females, even more than in males, the criterion of Test for Cure remains most unsatisfactory in the absence of the Complement-Fixation Test. Each patient has been observed carefully for at least six weeks after cessation of all treatment—swabs being taken from the cervical canal at weekly or fortnightly intervals. Of the 48 women examined in this way 46 were still free of all signs of the disease at the end of this six-week period of observation. It should be clearly stated, however, that no claim is made for a 'cure' in these cases.

Discussion

A series of 163 males and 132 females have been treated for gonorrhœa. Of these 113 males and 101 females have received sulphanilamide; 32 males and 17 females have received manganese butyrate and local treatment; 18 males and 14 females have received mixed gonococcal vaccine as well as local treatment.

Of the 113 males, 68, or 60 per cent, were clinically cured in a fortnight, and a further 11 after a second course of sulphanilamide, a total of 70 per cent in four weeks. Of the 101 females 49 were free of signs or symptoms in a fortnight, and a total of 66 per cent in four weeks from the commencement of treatment. Sulphanilamide has been used alone, combined with injections of manganese butyrate, and combined with local treatment. In both males and females the compound seems to work as well alone as when used along with other treatments.

The reactions noted have been those previously recorded by other observers—chiefly gastric disturbances, headache and erythematous eruptions. Most of the reactions have been comparatively mild, with few exceptions necessitating cessation of treatment. These reactions have only been recorded with a dosage of 4.5 grammes or more per day.

The results in this series are not as good as those reported by Dees and Colston or by Crean—70 per cent in males, and 66 per cent in females clinically cured, compared with nearly 80 per cent by the former and 90 per cent by the latter observer.

Conclusions

1. An attempt has been made to standardize the dosage of sulphanilamide in the treatment of gonorrhœa.

2. The use of sulphanilamide, with this routine dosage, has shown the compound to be definitely superior to manganese butyrate or vaccine.

3. The dosage used is not enough to prevent several relapses but a larger dosage is too toxic for routine use.

4. The complicated case of gonorrhœa responds as rapidly as the less advanced case to therapy with sulphanilamide.

5. Sulphanilamide appears to give the same results when used alone as when used in combination with other systemic or local treatment.

6. Much remains to be done before this drug can be used as routine treatment for all cases or gonorrhœa.

7. A generally accepted standard of cure of gonorrhœa is a necessity in order that the results of various observers may be comparable.

The Management of Insomnia

By HENRY COHEN, M.D., F.R.C.P.

(From the *Practitioner*, February 1938, Vol. CXL, p. 181)

THE rational treatment of a patient has two aims. It seeks in the first place to remove the causes of disease; secondly, it endeavours to restore to normal those disturbances of bodily function resulting from disease. The former will not necessarily accomplish the latter. A burn demands treatment even though the fire which caused it has been extinguished, and this treatment is based on our knowledge of the bodily changes which accompany burns. So with insomnia. A discussion of its causes, and of the physiological mechanisms which result in sleep or wakefulness, is a desirable preliminary to a consideration of the management of insomnia. But these mechanisms are, as yet, imperfectly understood; hence many of the fundamental disturbances resulting in insomnia remain unrevealed. Purely palliative measures are in these circumstances the only therapeutic weapons, and they must be employed also when a cause, though known, is ineradicable.

Despite incomplete knowledge of the physiology of sleep, certain helpful facts are well founded. We know that accompanying sleep is a *depressed activity of the cerebral cortex* and that any factors, physical or mental, which tend to perpetuate cortical activity—for example, pain and dyspnœa, worry and strain—render sleep more difficult to procure. It is known also that there are marked individual variations in the depth of sleep, in the amount of sleep required, and in the ease with which sleep comes.

When, therefore, insomnia is the presenting complaint, the victim's normal *sleep-pattern* should be ascertained and the type of deviation therefrom noted. Sometimes it will be found that he cannot fall asleep for some hours after retiring but when once asleep, he remains undisturbed ('delayed' sleep); if he has to be awakened for work at an early hour he will have less

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sleep than he requires; if he remain undisturbed he will usually secure adequate sleep. Or he may fall asleep as usual but wake fitfully during the night, often disturbed by dreams or nightmares, and rise from his bed unrefreshed ('light' sleep). Or he may fall asleep quickly but wake during the early hours of the morning and be unable to recapture his sleep ('curtailed' sleep). It must be remembered that insomnia is a symptom which some patients tend grossly to exaggerate. Many complain bitterly of insomnia who, on close questioning, are found to have awakened for an occasional short period during the night but who nevertheless have had adequate rest and show no symptoms of sleep-deprivation.

Clinical groups

Sufferers from insomnia can be separated into two large groups:—

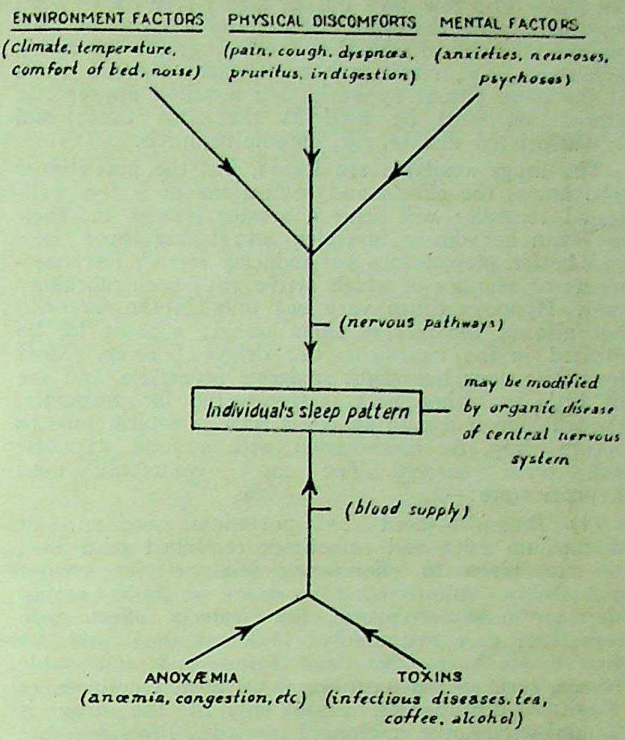
(1) In the first group are those in whom the insomnia is a symptom of an obvious and dominant ailment which may be (*i*) physical or (*ii*) mental. A host of physical discomforts may be quoted as examples—the pains of pleurisy and arthritis, the pruritus of diabetes mellitus and urticaria, the dyspnœa of cardiac failure and asthma, the frequency of micturition of cystitis or chronic Bright's disease, the palpitation of Graves' disease, the cough of chronic bronchitis. Mental factors too are almost limitless—the worries of business, domestic anxieties, financial embarrassments—and these are usually volunteered by the patient, or confessed on sympathetic probing, as the explanation of his insomnia. It is evident that this group of cases of insomnia—sometimes designated *secondary insomnia*, because the sleeplessness is secondary to patent physical or mental causes—demands the removal of the cause for its rational treatment. But even though the cause is known it may be difficult to remove, *e.g.*, the anxieties due to an extravagant wife or an erring child, and sympathetic treatment will be necessary if the ill effects of prolonged insomnia are to be avoided.

(2) This second group—often referred to as *primary* insomnia—comprises those patients whose principal and presenting complaint is sleeplessness and its accompanying symptoms and signs of exhaustion both physical and mental. A large proportion of these cases will be recognized as secondary after free and careful interrogation has unmasked a cause which the patient in his ignorance had not related to his complaint, *e.g.*, the anxiety and strain of working under an unduly exacting master. If the search for the simpler causes is fruitless after detailed and adequate inquiry, two conditions demand consideration, (*a*) an anxiety neurosis, the cause of which may be revealed by prolonged analysis, and (*b*) an early psychosis specially of the manic-depressive type. It may be that once insomnia has resulted from a known cause it is perpetuated as a compulsive or obsessional neurosis, not infrequently associated with fear of losing the reason.

The terms 'primary' and 'secondary' in relation to insomnia should be confined to this purely descriptive sense. In the former the insomnia is the dominant symptom, although its cause may appear after prolonged psychological observation and investigation; in the latter it results from an obvious or easily ascertainable cause.

Notable variations in response to an anxiety of similar type and intensity occur in different individuals and even in the same individual at different periods. In some people, the relatively slight disturbance of fresh surroundings, a strange bed, retiring late, unusual noise, or even unaccustomed silence will cause sleeplessness. Occasionally a very late meal, or coffee, tea, alcohol, or smoking before retiring to bed will be followed by insomnia; at other times they fail to disturb sleep.

Thus, whilst the individual's sleep-pattern varies slightly from time to time, gross disturbances follow those extrinsic influences which have been discussed above. It is helpful to the understanding of the treatment of insomnia to represent this in simple diagrammatic form.



Variation in sensitivity of the neural mechanism responsible for an individual's sleep-pattern may arise in organic disease of the central nervous system, *e.g.*, in epidemic encephalitis, in cerebral arteriosclerosis, in third-ventricle tumours; if insomnia results it demands treatment.

Treatment

A consideration of the diagram indicates the principles of treatment in insomnia. Sleep will be promoted (1) by the removal or allaying of (*i*) physical and mental discomforts, (*ii*) disturbing environmental factors, and (*iii*) offending toxins in the blood stream; and/or (2) by so depressing or modifying nervous activity by drugs, physiotherapeutic or psychotherapeutic measures that disturbing influences cannot reach, and thus affect the neural mechanism of sleep. I have refrained from suggesting that therapeutic measures may directly influence the so-called 'sleep centre' in the floor of the third ventricle as our knowledge of this is meagre.

A comfortable bed, an equable temperature, regular habits, avoidance of late meals, adequate relaxation, assurance that the insomnia will not lead to mental breakdown, a frank discussion of difficulties—business, domestic, social and sexual—all these may suffice to restore sleep. Pain must be relieved, cough alleviated, and other disturbing factors treated by appropriate measures when they cause insomnia. But when the cause is obscure, or when the cause is known but likely to be prolonged, then treatment must be more active if the deleterious effects of insomnia are to be avoided or the vicious circle of insomnia inducing an obsession is to be broken. To this end the three groups of measures at our disposal need more detailed discussion.

Drugs are a most valuable and effective adjunct to treatment, but to use them recklessly is to court disaster. They act by depressing the nervous system and thus shut out from it external influences which may disturb the normal sleep-pattern. It follows that the more potent these factors the more potent must be the drug prescribed. But the potency of these drugs is not without its dangers. They may (*i*) be habit-forming, (*ii*) depress the nervous control of vital functions, *e.g.*, respiration, and so endanger life, and (*iii*) be toxic to certain organs of the body, *e.g.*, the

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kidneys. Hence we must be guided in the choice of hypnotics not solely by the intensity of its action but also by (*a*) how long it is likely to be required; in an illness of a few days' duration, *e.g.*, pleurisy or post-operative pain, the more potent remedies can be used without the risk of addiction developing; (*b*) associated symptoms, *e.g.*, respiratory or cardiac distress, when if the more potent hypnotics are required appropriate stimulation must be used at the same time; and (*c*) associated disease, *e.g.*, chronic nephritis.

The drugs available are legion, but the practitioner who knows the effects and indications of a few well-tested remedies will achieve greater success in their use than he who is inveigled into trying those 'new and better preparations for inducing sleep', advertisements or samples of which arrive with each morning's post. Hypnotic drugs vary not only in the *intensity* but also in the *rate* of their action; a point to be utilized in the treatment of 'delayed' sleep. Most hypnotics show but slight analgesic properties, and are of little use when pain is responsible for insomnia, though here if a mild analgesic such as aspirin fails to secure sleep, its combination with a mild hypnotic will often succeed. The most commonly used hypnotics are:—

(1) *Bromides*—used as potassium, sodium, or ammonium salts, and sometimes combined with beef tea, or given in effervescing mixtures for greater palatability. Administered in doses of 20–30 grains, they are mildly hypnotic, but scarcely affect pain sensation; they act rapidly (15–30 minutes) and for four to six hours. No habit forms, and undesirable effects, such as acneform eruptions, mental dullness, or digestive disturbances, ensue only if the drug is administered over prolonged periods. Bromides are excellent in 'delayed' sleep, and in the insomnia resulting from mental worry and strain, and the mild anxiety neuroses.

(2) *Choral hydrate* given orally in a dose of 10–20 grains usually acts in thirty minutes and produces a restful sleep lasting six to eight hours. In large doses—60 grains—the sleep is deeper, pain is dulled, respiration is slowed and, in some cases, the pulse weakens; it tends to depress the respiratory and vasomotor centres and also the heart-muscle, but these effects do not occur with the dose suggested, in which it is an excellent, reliable and non-habit-forming hypnotic. For the light restless sleep of anxiety it is most valuable; it can be combined with bromide for the delayed sleeper.

(3) *The barbiturates.*—Of these *veronal* (barbitonum B. P.) in doses of 5–10 grains was until recent years the most widely used. It has little analgesic effect but produces a restful sleep in ½–1 hour, lasting six to eight hours. After-effects are rare but addiction is not uncommon if constantly used and may be accompanied by toxic effects, such as impaired mental acuity, diplopia, peripheral neuritis, and erythema. The sodium salt of veronal—*medinal*—in similar doses acts more quickly but is subject to the same disadvantages of habit-formation and chronic poisoning. More commonly used to-day is *luminal* (phenobarbitonum, B. P.); in doses of 1–2 grains it acts in ½–1 hour, and is more powerfully hypnotic than veronal; it has little analgesic action but subdues motor excitability and is especially valuable when motor restlessness prevents sleep. It is but slightly habit-forming but some patients develop pyrexia with an erythematous eruption which may pass into an exfoliative dermatitis; this is probably an evidence of marked susceptibility to the drug. A large number of barbiturates have been synthesized and used as hypnotics, and it is well in a patient who requires them to ring the changes frequently so that tolerance to one preparation is less easily established.

(4) *Paraldehyde* in doses of 60 to 120 minims acts in 15 minutes, for four to six hours. In medicinal doses it rarely produces toxic effects and addiction is rare, though not unknown. It has a repulsive taste and smell which brandy mitigates but little. Its rapid action and its easy administration rectally make it a useful hypnotic in acute disease, *e.g.*, pneumonia.

(5) *Opium and its derivatives* are the most powerful hypnotics and analgesics, but they are respiratory depressant, and with their more than occasional use there is grave danger of habit-formation. They should thus be used only in acute illnesses of short duration or in incurable disease.

I have not discussed *sulphonal* and its derivatives for their action is so uncertain both in rate and duration that they have no great merits. Moreover toxic effects, *e.g.*, hæmatoporphyrinuria, are not uncommon. For similar reasons I omit references to the *urethane* group.

The indications for drug treatment in any given case must be carefully weighed and the appropriate remedies chosen. The anxious student before an examination with 'delayed' sleep will be helped by bromides; if sleep is 'light'—small doses of chloral hydrate or a barbiturate may be given; but if the acute pleural pain of lobar pneumonia is preventing sleep, morphine will be necessary and its respiratory depressant action counteracted, especially in the latter stages of the disease, by appropriate stimulants.

OTHER MEASURES

Physiotherapy.—In the milder forms of insomnia, especially when associated with anxiety, soothing massage to the head and neck at bedtime will often induce sleep. If dyspeptic symptoms of the spastic-colon type are present, abdominal massage is a helpful measure. Tepid baths for 20–30 minutes before retiring, followed by a warm drink, induce a relaxation which aids sleep. Spa treatment has advantages not because of its intrinsic merits but because it ensures (*i*) regular habits of meals and exercise, (*ii*) a pleasant climate and environment, (*iii*) freedom from business worries, and (*iv*) the stimulus of undertaking a defined regime with an assurance of relief.

Psychotherapy, as in the treatment of diseases in general, plays a potent part in all measures designed to overcome insomnia. Sympathetic reassurance and understanding; frank discussion of various troubles all help. Simple measures, both physical and medicinal, must be prescribed with the confident assurance that good will ensue. Doubts about the grave effects of mild sleeplessness on metal activity must be dispelled. The mere presence of a sedative at the bedside to be used in case of need may suffice to induce sleep. But formal psychotherapy is of less value. Hypnosis is at best of temporary benefit only. Psycho-analysis might unmask repressed anxieties but it must be undertaken with caution for the cases in which it is helpful are few in number, and in the psychoses it is not only useless but may be harmful.

CONCLUSION

Insomnia is a symptom which demands treatment *per se* because its effects may be deleterious in both acute and chronic illnesses. But as an essential preliminary to its proper management, all possible etiological factors must be recognized and assessed, for only in this way will rational therapy be achieved.

Otitis Externa: "Hot-Weather Ear"

By G. MORLEY, F.R.C.S.

(Abstracted from the *British Medical Journal,* Vol. I, 19th February, 1938, p. 373)

THE scope of this contribution is limited to inflammation of the external auditory meatus apparently caused by hot humid climatic conditions and associated with an infection with *B. pyocyaneus* in pure culture. At the aural clinic of the Royal Air Force Hospital, Aden, a series of 100 cases was investigated, a line of treatment evolved on a simple practical basis, and search made for a common causative factor.

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OCCURRENCE

Infections of the external auditory meatus with *B. pyocyaneus* among the troops in Egypt were described during the Great War, and more recently have been reported from the Seychelles, Canton, Ascension, East Africa, America, and Australia. Inflammations of the meatus are common in the troops generally and are often ascribed to a fungus infection. The conditions appear to be very similar and equally resistant to treatment, but as none of the cases which were bacteriologically examined in this series was found to have a fungus infection or any organism other than *B. pyocyaneus* and *Corynebacterium ceruminis diphtheriæ*, no attempt is being made here to discuss any other infection.

A record of the monthly total of new cases was kept and it was noted that the majority were affected during the May–June and August–September periods, more particularly the former. At these times—the beginning and the end of the south-west monsoon—the temperature and the relative humidity increase, and there is scarcely any appreciable 'cooling off' during the night. 'Prickly heat' is also very common at this period; both conditions, however, improve under the fresher weather during July and August, and during the cool season they almost entirely disappear.

ÆTIOLOGY

It has been thought desirable to investigate two popular theories—that of causation by bathing, and that of irritation by sand or interference. Of the 100 cases only forty-six had bathed in the sea within approximately one month previous to the onset of symptoms. Of these, thirty-five were regular bathers, the remainder taking only an occasional swim. Twenty-one used wool plugs in the ears while bathing, and twelve admitted to cleaning the ears with wool wound on match-sticks after bathing. The average number of baths per week among the regular swimmers was 2.85.

While it is admitted that the number of cases is small for the purpose of forming a definite judgment, these figures appear to discredit the sea-bathing theory. Fresh-water shower-baths were taken, on an average of two a day, by ninety-five of the patients, and ordinary slipper-baths by forty. The water used for this purpose is supplied from deep artesian wells and is also used for drinking. It is analysed regularly at the Royal Air Force Laboratory, and no evidence of fæcal contamination has been evinced. Only twenty-five of the patients could fairly be considered to have been more exposed than other residents to sand in Aden, where the amount is not great: one or two minor sand-storms may occur in July, August, or September. It was observed that a few individuals had served for some years in India or Iraq and had been unaffected by real sand-storms, while at a time when personnel were encamped locally in bad drift sand the incidence of the condition did not increase. None of the cases had any gross disease of the ear, nose, or throat on examination, other than the meatitis.

The origin of the organism is still in doubt. Fæcal contamination has been suspected, but there is hardly any water-borne sanitation in Aden at present, and, as has been noted, there is no evidence of a contaminated water supply. It is, however, a fairly ubiquitous organism, and it appears that certain factors promote its growth and render it pathogenic. No suggestion can be given as to the reason why *B. pyocyaneus* in particular should be the infecting organism. It is believed that the chief of these factors is moisture and maceration of the epithelium, especially if devitalized by trauma. It is well known that these cases present a moist appearance clinically, and that the corollary in treatment is to keep the ear dry. Also it is shown that most cases are infected when the humidity of the climate is greatest.

There is no evidence that all these cases are associated with *B. pyocyaneus* infection. For these reasons the term 'hot-weather ear' has been maintained—a term used by Lieut.-Colonel Palmer, R.A.M.C., when he described it as a clinical entity because this appears to be the strongest ætiological factor.

CLINICAL ASPECTS

Otitis externa has been described as clinically divided into two categories—the dry and the moist. This division has not appeared to be at all satisfactory, and for the purpose of description and treatment it has been found desirable to enlarge upon it. The classification adopted here is as follows: (1) acute; (2) subacute; (3) chronic; and (4) relapsing. The first two conditions and usually also the third are 'moist', whilst the fourth is 'dry'. There is, however, considerable overlapping between these classes.

1. *Acute.*—The patient usually complains of acute pain in the ear, often of a throbbing character, that has developed after a variable period during which he will have noticed increasing discomfort and usually some discharge from the ear. Pyrexia of 101°F. to 103°F. and pre- and post-auricular lymphadenitis often occur. Occasionally there is a slight degree of trismus, and mastication is painful. On examination the auricle may be slightly œdematous, and any movement of it becomes acutely painful. The meatus is occluded by swelling of the epithelial walls, which appear white and sodden, and a white curdy covering is often observed externally. The tympanum is not visible by ordinary auriscopic examination, and there is moderate diminution of hearing. If the meatus is examined under an anæsthetic the inner part is seen to be covered with sodden white epithelial debris, removal of which shows an inflamed, red, and very angry-looking meatus; but only rarely is there a definite boil to be seen. The tympanum is usually only affected to a slight degree; the normal light reflex is diminished, and the external surface is most frequently granular in appearance. Sometimes there is moderate injection in the region of the malleus, but never any bulging or pulsation. In most cases the tympanum is normal and mobile. As the condition progresses under treatment there comes a point of relief from the acute symptoms which is sometimes associated with the liberation of thin sero-purulent fluid and resolution of the acute phase temporarily. Observation and incision have failed to locate definite pus during this stage.

2. *Subacute.*—The majority of cases are first seen in this stage, and a large number can be prevented from becoming acute. The complaint is of an aching ear, often associated with discharge from the meatus, which causes a yellow stain on the pillow-slip overnight. Slight adenitis may be present, and the auricle is tender on movement but not acutely painful. Hearing is only slightly diminished, but most distressing symptoms are caused in the hot humid atmosphere, and sleep is lost at night. Concentration at work is very difficult, and the condition may well be described as extremely aggravating. On examination the meatal walls are considerably swollen and 'soggy', with plaques of white cheesy debris partly adherent and partly lying in the lumen. The tympanum can usually be seen through a narrow space and is generally normal. One very characteristic pitfall is a curtain of debris immediately lateral to the tympanum, usually incomplete, which very closely resembles a perforated tympanum with acute meningitis, the whole being bathed in purulent exudate. It is only when this has been removed that a normal tympanum is found to exist, and the differentiation of these conditions is largely a matter of familiarity with the appearances on auriscopy. For this reason the bright magnified view obtainable with an electric auriscope makes this the most useful method of examination. Removal of the sodden debris leaves excoriations which bleed very readily, and the ear then becomes more painful. Only those pieces which appear already detached can be removed without causing further trauma. There is in addition a thick purulent exudate, which lines the meatus and is very tenacious and difficult to remove efficiently. Most particularly is this true of the antero-inferior recess of the meatus immediately lateral to the tympanum. In long-standing cases this pus has

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been observed to assume a yellowish-green coloration with great regularity.

3. *Chronic.*—In this stage without treatment the condition in unfavourable circumstances readily relapses into the subacute phase. With treatment, however, and efficient careful removal of debris, the meatus assumes a slightly thickened red appearance, while scaly flakes of dead epithelium form on the walls. The tympanum is normal, but there is most frequently a sodden 'subacute' area in the recess medial to the elevated floor of the meatus which is extremely difficult to eradicate. The chief symptom of this stage is most profound and distressing irritation, whilst the condition is aggravated by the rubbing and shaking of the auricle which this irritation provokes. There is a variable amount of discharge, which is of very thick greenish-yellow pus. Hearing is almost normal.

4. *Relapsing.*—In this stage the ear is to all intents and purposes normal both to the patient and on inspection. For a week or two after the chronic stage has been cleared after-treatment is necessary, as under very humid conditions the ear sometimes 'feels wet again'. If this is ignored recurrence is likely. In some cases this feeling persists during the hot season, and more acute symptoms can then be precipitated by the injudicious use of glycerinated ear-drops and wool plugs in the meatus, designed to keep out irritating particles of foreign materials such as sand and dust. Cases under the heading are regarded as potential infections and are given prophylactic advice and treatment.

Bacteriology

Meatal swabs were taken from thirteen typical cases in varying stages. The reports upon each were of Gram-negative, non-sporing, motile bacilli with no evidence of fungus. Eight produced pyocyanine on culture and gave the sugar reactions of *B. pyocyaneus*. All contained *Corynebacterium ceruminis diphtheriæ*.

The cases which were examined were selected at random, and presented lesions typical of the condition. It has already been pointed out that the pigmentation of the pus in the later stages and the definite yellow staining of the pillow-slips due to discharge from the meatus are fairly well-marked clinical signs.

In standardizing treatment cases were classified into the clinical groups described, and the routine was strictly followed according to the group.

Acute cases

With this group no effort was made to clean out the meatus; to attempt it is sheer brutality, as the pain is exquisite. The meatus is very gently syringed with boric lotion, as hot as the patient will tolerate. After this the meatus is allowed to drain by posture for a few minutes. The ear is next filled with warm 1 per cent carbogiycerin drops and a hot boric foment is applied, large enough to include the pre- and post-auricular glands. This treatment is carried out four-hourly, and is combined with initial purging by 4 grains of calomel in split dosage followed by salts. At first there was considerable diffidence in syringing with really hot lotion, lest vestibular disturbances should be caused. However, this does not appear to occur in these cases; most probably because the lotion does not freely reach the depths of the meatus. The relief is great and almost immediate, whilst the removal of small portions of debris makes the application of the carboglycerin more effective. The latter has been used only in 1 per cent solution, and as such the analgesic effect has proved satisfactory when combined with the hot syringing and fomentation. The question of incision in these cases is interesting. In some earlier cases the pain was so acute that the meatus was examined under an anæsthetic. Sodium evipan was used, but no actual boil could be found. Once or twice the most turgid and inflamed region was incised without the liberation of definite pus. Despite the relief this procedure gives it is considered that incision is contra-indicated. Even if a definite boil is seen, which is unusual, it seems better to allow it to burst under the conservative treatment described; the pain is relieved speedily by both methods, and convalescence is not hastened by incision. Except for these early cases no occasion to incise the meatus has arisen during the last two years.

Subacute cases

These are cases in which there is partial occlusion of the meatus that is sufficiently painless to permit the introduction of instruments. In this group the object of treatment is to tide over and shorten the gap between acute occlusion and the relative patency of the chronic infection. The meatus is gently cleaned by direct application of dry sterile cotton-wool on malleable wool-carriers, under direct vision with reflected light. The electric auriscope is used only for inspection in this stage. When moderately clear of debris the meatus is packed firmly, but not tightly, with sterile half-inch ribbon gauze soaked in 1 per cent carboglycerin, being retained in position by an external wool plug. This procedure is repeated every twenty-four hours. The steady light pressure lessens the swelling, the glycerin loosens the dead epithelium, and the carbolic acts as a mild antiseptic and analgesic. This stage as a rule lasts only two or three days and leaves a clean but inflamed meatus, while debris persists in the recess near the drumhead.

Chronic cases

The routine adopted has been as follows. First the ear is cleared of obvious gross debris; a day or two on the treatment described for subacute cases have been found most successful for this purpose. The meatus is then dried with either ether or boric and spirit drops. After mopping with dry sterile wool the patient inclines his head right over, to bring the affected ear uppermost, and is warned to keep his eyes tightly closed. A small quantity of boro-iodine powder is tapped well into the meatus and insufflated with a Siegle's speculum into all parts of the meatus. Care is taken to avoid blowing the powder into the operator's eyes. The meatus is then quickly packed with the powder until it is full, the whole being lightly tapped home. Without delay the meatus is now plugged with a firm pledget of wool.

The dressing is left undisturbed for forty-eight hours. It causes slight discomfort for the first hour or two, but in no case has this been intolerable. At the conclusion of this period the ear is very gently syringed to clear away the remains of the powder, the greater quantity of which has usually been dissolved, and the meatus is filled with boro-spirit drops for a few moments, afterwards being drained by posture. It is sometimes necessary to detach dried pieces of dead epithelium with forceps, and occasionally small casts of the meatus are removed in this way; otherwise the use of instruments is avoided at this stage, and the meatus is not kept plugged with wool. Boro-spirit drops are applied twice daily for two days, and the treatment is repeated if it is then found necessary. As a rule only two such applications of boro-iodine powder have been indicated, although repetition has occasionally been necessary after about ten days.

Essential points are the drying of the meatus, speed in the application of the boro-iodine powder as the iodine evaporates rapidly in hot climates, and the subsequent avoidance of any form of plug in the meatus. The reason for the last named is that the cartilaginous portion of the meatus contains sweat glands, and any plugging distal to these must cause increased humidity in the meatus and maceration of the epithelium, conditions which predispose to recurrence. With the use of only a thin film of powder it has been found that the iodine evaporates so quickly in a climate such as that of Aden that the filling of the meatus as described is regarded as essential. In no case has this caused any trouble: within a few hours the powder appears to be dissolved by the moisture of the plugged meatus.

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AFTER-TREATMENT

Most cases are now discharged from the clinic with a bottle of boro-spirit drops, a small quantity of which they are advised to insert into the meatus last thing at night. Patients are instructed to dry the ears carefully after bathing, especially after taking a shower-bath, by gently shaking with a towel inserted in the auricle on the tip of the little finger and with the head inclined over on the side. The insertion of wool plugs is strongly discouraged for the reasons mentioned above, although the question of using 'a plug of cotton-wool soaked in olive oil during bathing' frequently arises. Unsterile oil and dirty wool are often used, and the plug is sometimes forgotten. It is of doubtful efficiency, and is needless if the ear is carefully dried.

PREPARATION OF BORO-IODINE POWDER

The method described by Scott Stevenson was taken as a guide and modified to suit the climate of Aden. The following description has been prepared by the dispenser at the Royal Air Force Hospital, Aden:

'For the preparation of iodized boric powder sublimed iodine is used in a strength of 1 per cent in acid. boric. pulv.; the iodine is first broken down with a few drops of alcohol 90 per cent. The boric acid is added in powder form in small quantities as quickly as possible, using a non-porous glass mortar and keeping the mixture moving all the time. As soon as the iodine appears to be evenly distributed the powder is transferred to a wide-mouthed dark glass-stoppered bottle, without waiting for complete drying. Evaporation of the iodine is very rapid; if any delay occurs all the iodine is lost, and the use of a glass-stoppered bottle instead of cork is necessary to preserve the iodine content.'

OTHER METHODS OF TREATMENT

In many papers dealing with this and allied conditions there appears a variety of treatments, a number of which has been tried here in the hope of finding one more satisfactory than the others. At first diligent mopping of the meatus with hydrogen peroxide, then drying with ether, and applying a solution of silver nitrate in spiritus ætheris nitrosi was tried. Then spirit and biniodide of mercury, 1 in 4,000, was substituted for the ether. Argyrol (2 per cent), mercurochrome (1 per cent), and liquid iodex packs were given exhaustive trials, with disappointing results. Zinc ionization promised well; a course of five treatments each of 1/2 mA for one-half hour, a stronger current being uncomfortable, produced good results at first, but recurrences were numerous. Vaccine therapy was not tried, although recommended by some observers, because it was felt that a simpler and more practical method of treatment could be evolved which could be practised efficiently at out-stations. Phenyl mercuric nitrate was not used in this series.

Finally one case arose in which all efforts to obtain a cure appeared futile; the condition just continued to relapse. First one side would improve and the other commence to discharge, then the state would reverse. The man spent fifty-seven days in hospital, in addition to receiving 107 days of out-patient treatment. The organism was a typical *B. pyocyaneus*, and all the methods of treatment described were tried with no avail. In the end the meatuses were treated with boro-iodine powder on the lines now described, and after one application on each side the condition cleared up completely. He has since passed through the whole hot season without recurrence, and only occasionally applies a few boro-spirit drops at night-time. The routine treatment was then evolved and adopted, with results which have been very satisfying, although not always as spectacular as in this case.

RESULTS

Since the treatment described was adopted as a routine and applied to the later sixty-six of this series of cases the average number of daily attendances has been 8.27 per case (maximum, 24; minimum, 2). Previously, under the other forms of treatment, this was considerably greater, and in the earlier thirty-four cases of this series the average was 22.6, or, excluding the exceptional case to which reference has been made, 18.1, with a maximum of 72 and a minimum of 3. Admissions to hospital have totalled five from the earlier thirty-four cases (16.6 per cent) and three from the sixty-six later cases (4.54 per cent).

Published results of vaccine therapy are good after periods of weekly injections extending over some five or six weeks (maximum, 12; minimum, 3). The vaccines used were autogenous, but the suggestion is made that a stock vaccine might prove equally efficacious.

Phenyl mercuric nitrate, used 1 in 1,250 in 95 per cent alcohol, is claimed to have a spectacular effect on the acute stage and to shorten the course and hasten recovery in the chronic and long-standing cases.

SUMMARY

1. A series of 100 cases of otitis externa occurring chiefly during the hot humid seasons of Aden was investigated, and a representative number of cases were found to be infected with *B. pyocyaneus* in pure culture.

2. The influence of sea-bathing and a sandy atmosphere as ætiological factors are discussed and discredited; whilst the seasonal incidence is held to justify the term 'hot-weather ear'.

3. A routine method of treatment with facility of application is described, based upon boro-iodine therapy. The use of cotton-wool plugs in the meatus is discouraged. Prophylaxis and after-treatment are described.

4. The results of this form of treatment as applied to sixty-six cases are given, and are compared as far as possible with those of some recently published methods.

Reviews

THE BRITISH ENCYCLOPÆDIA OF MEDICAL PRACTICE.—Edited by Sir Humphry Rolleston, Bart., G.C.V.O., K.C.B., M.D., D.Sc., D.C.L., LL.D. Volume I. Pp. 742 plus xxxvi plus 60. Price, Rs. 25. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta

IN this volume the subjects dealt with range from abdominal pain to appendicitis; there were some 50 articles written by about 40 different contributors. All the contributors are well-known British authorities on the various subjects; those writing on tropical subjects, include Sir Leonard Rogers, the late Colonel Acton, and Colonel V. B. Green-Armytage.

The volume opens with a masterly introduction from the pen of the editor. Sir Humphry, in his finished yet easy style, discusses the different eras through which medicine has passed, from the pre-Hippocratic to the modern, post-Jenner, period; he asks the question 'What is medicine? Is it an art or a science?' It still remains an art which has been greatly helped by science (so much so that there is a danger of its losing its individuality and being transposed into a science). He then discusses the changes in the type of disease, nomenclature and classification, the birth of bacteriology and the surgical revolution, anæsthesia and radiology, and finally specialism and medical practice.

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Sir Arthur Hurst has a number of contributions on achlorhydria, on aerophagy, on anorexia nervosa and on achalasia: the last-named chapter is a somewhat unusual one, as it deals with achalasia of such widely separated structures as the pharyngo-œsophageal sphincter and the os uteri.

The chapter on anæmia, a very important one of 64 pages, is written by Dr. J. F. Wilkinson with sections by Dr. L. E. H. Whitby; a good account of the subject, commencing with a classification which is on the modern lines. If we have a criticism, it is that a little too much space is devoted to achrestic anæmia, in view of the doubts that exist about this disease as a separate entity.

Sir Leonard Rogers gives a very good chapter on amœbiasis; he does not, however, mention carbarsone in the treatment.

'Appendicitis' is written by Sir David Wilkie and is considered from the point of view of the practitioner, who may be called upon to operate himself.

All the articles are of a very high standard and are, above all, eminently practical.

L. E. N.

FOOD AND PHYSICAL FITNESS.—By E. W. H. Cruickshank, M.D., D.Sc., M.R.C.P., F.R.S.E. 1938. E. and S. Livingstone, Edinburgh. Pp. xi plus 148. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 3-12

THIS book is based on a series of public lectures delivered by Professor Cruickshank at Aberdeen. It is a type of book for which there is plenty of room, though it is in no way unique. The writer is a physiologist and nutrition worker of repute and the book has received the blessing of Sir John Orr, so we need not hesitate to accept the facts that are presented.

The book is a plain straightforward statement of the body requirements of food and of the means by which they may be provided. It was written, or rather the lectures on which it is based were delivered, for a Scottish public, but the facts presented will be found as useful for an Indian public, and the writer has gone to India and other foreign countries for many of the examples that he quotes to illustrate his points. In the section on 'some false ideas concerning foods' he provides a much needed corrective to the spate of food advertisements and the ridiculous statements of 'stunt' writers on weight reducing dietaries.

Though the book is based on a series of public lectures the information given will be found of great value to the practitioner, who will probably find much in it he ought to have known but does not know, and to the health worker, as well as to the housewife for whom it is primarily intended.

TROPICAL NUTRITION AND DIETETICS.—By Lucius Nicholls, M.D., B.C., B.A. (Cantab.). 1938. Baillière, Tindall and Cox, London. Pp. xi plus 164. Illustrated. Price, 7s. 6d.

TROPICAL medicine owes much to parasitology, but the debt is mutual, and in fact both studies have grown side by side during the last fifty years. It is not surprising, therefore, that in the study of tropical diseases the greatest emphasis should have been laid on the parasitological aspect of them. There has, however, during the last few years, been a distinct shifting of the centre of gravity from the parasitological to the biochemical aspect—in this latter is included the dietetic.

Dr. Lucius Nicholls' book is a welcome addition to the growing but still rather scanty literature on dietetics as applicable to tropical conditions. All the information he gives can easily be obtained elsewhere, but he has collected it and summarized it in a way that will be very useful to the tropical worker whose library is limited. The book might well be looked upon as a 'primer' in tropical dietetics as it is written in a way that not only the medical man but the layman can benefit from it; on the other hand, the man who has studied the subject will not find much of value in the book.

Dr. Lucius Nicholls has himself made an important contribution to the study of deficiency diseases and the papers in which he first described the condition he called phrynoderma appeared in this journal, it is natural, therefore, that he should be particularly interested in vitamin-A deficiency and his section on this subject is very complete. He has not been quite so fair to the vitamin-B deficiencies and there is no mention of the macrocytic anæmia associated with vitamin-B-complex deficiency. The only mention of anæmia is a statement that the common anæmia of the tropics is a microcytic anæmia which is mainly caused by hookworm infection and malaria. This is not, we believe, quite true, and the typical anæmia of malaria is not microcytic. A great deal of work has recently been done on vitamin-C estimations; some of these are given, but not the most useful.

A knowledge of dietetics is far more important to the practitioner in the tropics than it is to his opposite number in England, and this applies particularly to those who have to deal with labour forces. This useful little book fills a distinct want and should be in great demand.

L. E. N.

CLINICAL ATLAS OF BLOOD DISEASES.—By A. Piney, M.D., M.R.C.P., and S. Wyard, M.D., M.R.C.P. Fourth Edition. 1938. J. and A. Churchill Limited, London. Pp. xvi plus 127, with 42 illustrations, 38 in colour. Price, 12s. 6d.

WE are pleased to see another edition of this useful little book which has always been deservedly popular with students and practitioners. It gives the student visual impressions which they often find easier to retain than those received by other methods—for example, the plate of sickle-celled anæmia will fix a picture in his mind which no description would, and he may find this useful in an examination though the chances against his ever seeing a case will be about a thousand to one. The short descriptions are for the most part accurate and helpful, but quite naturally there are statements with which everyone will not agree.

The illustrations are on the whole good. In places they are a little crude and the 'diagnostic' points have been over-emphasized so that the student may be a little disappointed that in practice the different cells are not, so to speak, labelled as they are in this book. The reviewer does not like his illustrations of megaloblasts but then he does not like his definition of megaloblasts and erythroblasts either, and these are points about which no two hæmatologists are agreed.

Every book on a specialist subject should contain a glossary, as this book does. Altogether it is a book we can thoroughly recommend for the class of reader for which it was written.

L. E. N.

MAJOR ENDOCRINE DISORDERS.—By S. L. Simpson, M.A., M.D. (Cantab.), M.R.C.P. (Lond.). 1938. John Bale Medical Publications, Limited (85, Great Titchfield Street, W.1), London. Pp. x plus 184. Illustrated. Price, 10s. 6d.

THIS little book contains a concise statement of our present knowledge regarding endocrinology. It will be very useful to the student or examiner as the writer prefers to call him, assuming that we are all still students, and the practitioner. It is not a complete treatise on the subject; this is a distinct advantage as far as this class of reader is concerned, as treatises often contain much speculative matter which may help the specialist but is liable to lead the practical worker astray.

Despite the title of this book certain glandular disorders that cannot be considered major are included; there is, for example, a section on menstrual disorders. It is cheerful for the woman who may regret certain of the disadvantages that are associated with the menopause to think that she may attain 'greater

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resolution, command, initiative, originality and administrative capacity'.

The writer points out that familial obesity is often due to a familial habit of overeating. It is extraordinary how difficult it is to persuade the obese individual that he is overeating, because he can usually quote someone who eats much more than he does, but when he has the moral support of his family it is almost impossible.

It is a useful little book which we have no hesitation in recommending.

INFANTS IN HEALTH AND SICKNESS.—By R. E. Steen, M.D., F.R.C.P.I. 1937. Oxford University Press, London. Humphrey Milford. Pp. x plus 127. Illustrated. Price, 5s. Obtainable from Oxford University Press, Bombay and Calcutta

MORE than half this book is devoted to the feeding of infants in health, breast feeding under normal circumstances and under difficulties, and artificial feeding. There is next a chapter on gastro-intestinal disturbances. There are two short chapters on abnormalities and diseases in infancy and a final one on hygiene.

It is a very useful little book and the teaching is orthodox and quite up to date, but the title is, we consider, misleading—'Infant Feeding in Health and Disease' would have been better.

The author's style is not faultless. The preface opens with these lines:—

'This book, except for a few minor additions, is identical with the Infant Section as it appears in Tweedy's *Practical Obstetrics*. It was written and printed solely with this object in view, and it was only as an afterthought that the decision was made to publish it separately.'

With what object? And we should have thought that decision to publish the book would have been made *before* it was printed: our publishers are always adamant on this point.

We can think of no more inappropriate book in which to introduce, as does the author at the beginning of this book, the overworked—and certainly untrue in its present form—quotation about diagnosis, diagnosis and then diagnosis being the three important things in treatment, than one that deals mainly with infants in health and the way to maintain them in this state.

Nevertheless, we can strongly recommend the book as a sound and practical statement on the subject of infant feeding.

CLIMATE AND ACCLIMATIZATION.—By Sir Aldo Castellani, K.C.M.G., D.Sc., M.D., F.R.C.P. Second Edition. 1938. John Bale Sons and Curnow, Limited, London. Pp. x plus 198. Illustrated. Price, 10 shillings

THIS is not presumed to be a comprehensive work dealing with all the branches of the subject but is a collection of notes on some features of the problem, particularly on those which have a bearing on white settlement in the tropics. The work is based chiefly on personal experiences of the author in his long sojourns in many different tropical countries and he has endeavoured to emphasize the fact that climate *per se* has an important influence on the health of Europeans living in the tropics, apart from the rôle played by parasites and hygienic conditions. The text is divided in four chapters. In the first chapter there are short notes on the classification of climate, climate and man, climate and animals, climate and vegetation, the divisions of warm climates, and on temperature and humidity. The second chapter deals with the effects of climate and discusses the effects on body temperature, respiration, circulation, blood, blood-pressure, digestion, general metabolism, nervous system, urinary system, endocrine glands, fertility, growth, skin, tissues and on general sickness and mortality. The subjects of heat-stroke, heat-exhaustion, heat-cramp, sun traumatism, heat-low fever, heat-œdema, chills and cold-stroke have also been discussed in this chapter. The third chapter begins with a discussion of the effects of high and low atmospheric pressure, such as caisson disease and mountain sickness. The different kinds of wind, permanent, periodical and local, and their effects, and the different kinds of rays given out by the sun and their influence upon our health and complexion are discussed in this chapter. The fourth chapter deals with acclimatization, suitable head-gear, clothing, housing, etc., the adaptation of European women and children to tropical climates, white troops in tropical climates either for garrison duties or for military operations, and finally a few notes on the experimental researches on the influence of climate and adaptability to climate. A fairly long list of references to various textbooks, monographs and reports on meteorology, and the literature dealing with the effects of climate and acclimatization is appended at the end of the book. Written as it is by an author of very wide experience, this excellent handy volume will be read with great interest by a large circle of readers, both medical and non-medical.

S. G.

ANNUAL REVIEW OF BIOCHEMICAL AND ALLIED RESEARCH IN INDIA. Vol. VIII, 1937. Published by the Society of Biological Chemists, Bangalore, India. Pp. 185. Price, Rs. 3 or 6s. (inclusive of postage)

THE review has been discussed under the following heads: Vitamins, Proteins, Enzymes, Pharmacology, Human Physiology, Human Pathology and Bacteriology, Foods and Nutrition, Microbiology and Fermentation, Plant Physiology, Chemistry of Plant Products, Phytopathology-Mycology, Phytopathology-Entomology, Soils, Fertilizers and Manures, Animal Nutrition and Dairy Science, and Veterinary Science. Each section has been reviewed by some worker experienced in it and references to almost all the work done in India during the year have been given. The Society of Biological Chemists, India, deserve to be congratulated on this well-produced and useful publication and the volume will be welcome not only to all the research workers on Biochemistry and allied subjects but also to all those who are interested in the progress of science in India.

S. G.

A TEXTBOOK OF OPHTHALMOLOGY.—By Sanford R. Gifford, M.A., M.D., F.A.C.S. 1938. W. B. Saunders Company, Philadelphia and London. Pp. 492 and 249 illustrations. Price, 18s.

THE book is a good short reference book for the general practitioner for the treatment of eye diseases inasmuch as it lays stress on facts of real importance and systematically describes the most modern practical points in diagnosis and treatment.

The book will prove to be of value for medical students as well. The arrangement is very satisfactory for their training. In chapters I to IV containing methods of examination even short notes on trans-illumination and slit-lamp microscopy have been given. Chapter V deals with refraction where first of all the basic ideas of physical optics have been given and the chapter has been finished with a short outline of special optical appliances which might rouse the interest of the inquisitive student. In chapters VI to VIII. dealing with the various diseases, the anatomy and congenital anomalies have been described, so that the student is able to grasp what the actual disease picture is like. In chapter XVII, dealing with the disturbances of ocular motility, the latest methods of orthoptic treatment have been briefly mentioned, with systematized practical points which is a real advancement over older textbooks. Chapter XIX deals with 'Injury to the Globe'. This is rather short but this seems unavoidable in consideration of keeping down the size of the book. In chapter XX a good but short account of the therapeutic agents employed in ophthalmology is given. In chapter XXI we find 'Eye—General Disease', a subject quite important for the general practitioner, has been dealt with rather

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too briefly. In the appendix useful reference has been made to the standard methods of computing compensations and the regulations thereof.

The author has on the whole omitted pathology. The coloured plates have been very well reproduced but are few in number and the ordinary illustrations though numerous are rather indistinct.

S. K. M.

TREATMENT IN GENERAL PRACTICE.—By H. Beckman, M.D. Third Edition. 1938. W. B. Saunders Company, Philadelphia and London. Pp. 787. Price, 42s.

It is just four years ago since we had the pleasure of reviewing the second edition of this book. In that we said it was 'a well-arranged and eminently practical book'. It is now still just as practical and is better arranged. As a result of this, combined with judicious pruning of matter perhaps better dealt with in larger books on special subjects, the author has been enabled to add a great deal of new matter from the many advances in treatment that have occurred in the past four years and still to keep his book approximately the same size as the second edition.

Much of the information is necessarily condensed but a list of approximately 2,300 references provides ample opportunity to the reader of amplifying almost every subject discussed.

This book maintains its character of having kept right up to date so that it can be just as strongly recommended as the second edition as a book of reference for the busy practitioner, to find out the most modern methods of treatment in vogue in practically all diseases.

P. A. M.

DISEASES OF INFANCY AND CHILDHOOD.—By W. Sheldon, M.D. (Lond.), F.R.C.P. (Lond.). Second Edition. 1938. J. and A. Churchill, Limited, London. Pp. xii plus 739, with 125 text-figures and 13 plates. Price, 21s.

The appearance of the second edition of Dr. Sheldon's book on 'Diseases of Infancy and Childhood' in less than two years shows its popularity and demand. It proves that there is room for yet another book on diseases of children, as expressed by Dr. F. Still in a foreword; for the progress of knowledge in this particular department of medicine has been rapid during the past few years.

After an introductory chapter on the physical examination of children and their normal development, the book deals with the affections of the newborn and the management of the premature child. Next comes a chapter on the diet of the healthy infant, followed by an account of digestive disorders in infancy. Thereafter, the book deals with various diseases including mental deficiency and skin diseases. It covers the field of pædiatrics in a complete manner, allotting space to various conditions proportionate to their importance.

Several additions and alterations have been made in this edition. The chapter on intra-thoracic tuberculosis has been re-cast, and a distinction is no longer made between hilum tuberculosis and tuberculosis of the mediastinal glands. An attempt has also been made to clarify the part played in this disease by hypersensitivity to tuberculin. Recent therapeutic measures, such as the use of mandelic acid salts, sulphanilamide drugs, oxygen tent, etc., have been added.

An appendix has also been incorporated giving a table of common drugs and their appropriate dosage at the various ages of childhood. The illustrations are many and vivid, the index is complete and the production is good.

The book is useful and suitable for students and post-graduates. One comment may be made, that is, tropical diseases have not received sufficient consideration. Diseases, such as malaria and kala-azar, might perhaps have been included to the advantage of practitioners in the tropics.

R. C.

ARTIFICIAL FEVER PRODUCED BY PHYSICAL MEANS: ITS DEVELOPMENT AND APPLICATION.—By C. A. Neymann, A.B., M.D., F.R.S.M. 1938. Baillière, Tindall and Cox, London. Pp. xv plus 294. Illustrated. Price, 27s.

Dr. Neymann has reviewed in an excellent manner the result of researches in the treatment of diseases with artificial fever, a new and rather limited part of therapeutic medicine. The therapy concerns itself with the beneficial effects of raising the temperature of the human body by means of heat. Since these fevers are now usually produced by high frequency electric currents, instead of the older methods, the term *electropyrexia* has been coined. This is effected by supplying heat from without to the body, which is insulated to prevent its loss.

After a discussion on the basic theories and principles in the therapy, the book deals with the history of the development of the method. It is followed by detailed descriptions of the physiology and then the technique on electropyrexia. The rest of the book refers to its use in diseases, such as dementia paralytica, syphilis, multiple sclerosis, chorea minor, arthritis, gonorrhœa and asthma with a chapter on other diseases.

The book will be of considerable value to those interested in radiothermic treatment. The reader will obtain an easier insight into this subject than by reading the many articles that comprise the bibliography at the end of the volume. There are numerous illustrations, and the get-up of the book is excellent.

R. C.

SURGICAL ERRORS AND SAFEGUARDS.—By Max Thorek, M.D., K.L.H. (France), K.C.I. 1937. Third Revised Edition. J. B. Lippincott Company, Philadelphia and London. Pp. xvi plus 696. With 668 illustrations, many in colour. Price, 45s. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 33-12

To say that Professor Max Thorek has written a valuable book is, at best, poor appraisement for a notable work, which now appears in its third edition. Despite the noble traditions of the medical profession, there is no denying the fact that there is a large body of opinion which is sometimes passively but more often manifestly hostile to the present-day teaching and practice of the medical sciences. The reasons for this sad state of affairs are not far to seek. As Dr. Bevan rightly points out, in his foreword, 'the great increase in surgical procedures has brought with it two new and serious problems, *i.e.*, the doing of some unnecessary operations and the performance of operations by men who are relatively incompetent'. This disquieting statement may not apply to any one country in particular, but it should engage the serious attention of the controlling bodies.

Humility, in a surgeon, is of no less importance than technical skill and self-confidence. The author feels that a 'personal experience of over twenty-five years in the practice and teaching of surgery justifies him in acting without presumption or vanity as a mentor to those who are entering on the perilous path of surgical practice which he has trodden'. We venture to assure the author that it is not only the neophyte who is likely to profit by his experiences, but also many a hardened surgeon will remember with advantage his aphorisms and dicta. There will be general agreement with the statement that 'operation is not synonymous with surgery and that primary object of surgery is not operation, but the cure of the patient'. It is true that the devastating criticism of the past that 'the operation was in every way successful but the patient died', is no longer tenable, but it has now been replaced by the case of the successful operation

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followed by chronic invalidism. The author has done well, therefore, to emphasize again that in dealing with the patient the surgeon is expected to follow the golden rule. He should never perform an operation on a patient which he would not want to have done on himself under the same circumstances.

The making of a surgeon is a comparatively slow and gradual process, dependent on the assimilation of experience and mastery of technique. Preventable catastrophes and other infractions in surgery are usually due to three fundamental causes, 'ignorance, dishonesty, and bad judgment'. This is forceful language, but justifiable. That foreign bodies like surgical instruments, sponges and dressings are at times accidentally left within the abdominal cavity during surgical operations is a well-known fact. Surgeons are only human and therefore they 'do not like to confess mistakes and there are reasons, legal and otherwise, why the error of leaving a foreign body in the abdomen, or elsewhere, during an operation should be hidden'. It is common knowledge that 'the accident occurs with much greater frequency than one would suspect on the basis of statistics', yet the author's references run to several hundred cases. We do not remember ever having seen an instance mentioned in the published annual returns of our larger hospitals!

Enough has already been said in praise of this book. The author certainly deserves our thanks for his courageous advocacy of conservatism in surgery, strictly consistent with efficiency and simplicity of technique. Volumes, it is true, are now and again published, for the laity, with a pseudo-scientific flavour conforming to the requirements of sensational journalism, thus bringing the honourable medical profession into disrepute for the sins of the few. This book has the great merit of not belonging to this category. Within the compass of 700 pages and 16 chapters there is a store-house of experience and sagacity which the practising surgeon and the post-graduate student of surgery can ill afford to ignore. This book should find a place in the library of every surgeon.

The printing, binding, and illustrations are excellent. Each section has an adequate bibliography and the book concludes with an exhaustive index.

P. N. R.

SURGICAL HANDBOOK FOR HOSPITAL ASSISTANTS IN THE TROPICS.—By W. K. Connell, M.B., Ch.B. (Glas.), F.R.C.S. (Eng.), D.T.M. & H. (Lond.). 1938. John Bale Medical Publications, Limited, London. Pp. xvi plus 440. With 177 illustrations. Price, 12s. 6d.

THIS book is apparently not intended for medical students, practitioners, or nurses. It is therefore difficult to place it in any of the usual categories. It would be easy to find faults in such a book but there are some glaring ones which cannot be overlooked. On septicæmia the author says that 'the medical departments of Tanganyika and Kenya have been so impressed by the anti-streptococcal power of "Prontosil" that they are now using it to the *entire exclusion* of anti-streptococcal serum which is no longer purchased' (p. 19). Yet (on p. 31) it is stated that 'the anti-streptococcal serum is of great value in erysipelas, cellulitis, etc.'! Referring to vaccines, the author declares with emphasis that his own personal experience has been *disappointing* (p. 25), yet he goes on to say that 'all cases of erysipelas, most cases of cellulitis, and many cases of whitlow are due to streptococci and may be benefited by streptococcal vaccine' (p. 31). The author has expressed the hope, in a foreword, that he is looking forward to achieving standardization of treatment in the tropical hospitals and also to the time when he can say to his dispenser 'this patient is suffering from so-and-so, I wish you to give him the treatment, which is described on page such-and-such of my textbook'. The many palpable inconsistencies, we are afraid, will, at once, dash his hopes to the ground. In any case such a method of surgical practice is certainly liable to shock the feelings of medical practitioners, but the author declares that he is unrepentant.

The African dispenser is expected to perform minor operations like tapping a hydrocele under aseptic conditions. There is, however, an illustration depicting the performance of this operation with the surgeon's hands in position, the scalpel ready, but the diseased organ displaying a luxuriant growth of pubic hair (p. 356)! One may wonder why the prospective surgeon is not aware of shaving as a first principle of asepsis. The author has been particularly mindful of simplicity of language in imparting surgical knowledge. We are not very sure that he has achieved the desired success when we read that 'it is extremely dangerous to kiss a *patient* suffering from the secondary stage of syphilis' (p. 92). The italics are ours. As we are unfamiliar with the conditions prevailing in East Africa, it is difficult to give an opinion as to the utility of this book. But it seems to us that efficient practical training would be more important and beneficial for this type of hospital assistant than a smattering of book knowledge.

P. N. R.

SICK CHILDREN: DIAGNOSIS AND TREATMENT.—By Donald Paterson, B.A. (Manitoba), M.D. (Edin.), F.R.C.P. (Lond.). Third Edition. 1938. Cassell and Company, Limited, London. Pp. 604. With 15 half-tone plates and 75 figures in the text. Price, 12s. 6d.

THE second edition of this book on children's diseases, published in 1937, was reviewed in the columns of the April issue of this journal last year. The demand for a third edition within so short a period is sufficient testimony to the excellence of the matter and the clear and concise nature of its presentation.

The book deals with facts, not theories; its compactness and the fact that the description of rarer diseases are printed in smaller type make it very suitable for the medical student and general practitioner, while the student reader will find in the copious footnotes and references material for wider reading and investigation.

Complete revision has been done and recent advances particularly in the field of chemotherapy, infections of the accessory nasal sinuses, Sonne dysentery, epidemic jaundice and diabetes have been incorporated in the text. The useful table showing the normal composition of cerebrospinal fluid, fæces and blood in children, printed inside the cover, is repeated, and for the use of those going up for examinations in child health the examination papers in appendix 2 have been brought up to date.

The growth, development and diet of the normal child is the proper starting point for the study of sick children, and it is fitting that the care of the normal child as well as nutritional disorders should receive detailed attention. Altogether the book can be confidently recommended as an excellent introduction to pædiatrics.

J. M. O.

CUTANEOUS CANCER AND PRECANCER: A PRACTICAL MONOGRAPH.—By G. M. Mackee, M.D., and A. C. Cipollaro, M.D. The American Journal of Cancer, New York. Pp. xv plus 222, with 245 illustrations. Price not stated.

THIS is a valuable monograph as it collects in a remarkably condensed form nearly all the information available on the subject of cutaneous cancer. The book is only of 212 pages several of which are occupied by bibliography. In these pages there are 231 photographs and microphotographs many of which occupy a whole page so it is clear the reading matter is not great. Nevertheless the essentials are given and theoretical discussions avoided, thus making it a book for the practitioner rather than the laboratory worker. Treatment is also only indicated, it being left for the reader to acquire the detail elsewhere; this we look on as an advantage.

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The illustrations are beautifully clear and well selected, and the photomicrographs without exception show what the descriptive captions state is demonstrated in the figure, a thing which cannot be said of all photomicrographs. They are so good and the descriptions so adequate that if published in the form of an atlas without any amplification by printed matter they would be of great educational value.

A remarkable omission in the book is that there is no mention of the work of Paul and other Australian dermatologists who have contributed largely to the subject of solar dermatitis and epitheliomata, on account of the high incidence of these conditions in that country.

P. A. M.

SPEECH TRAINING FOR CASES OF CLEFT PALATE.—By M. C. Oldfield, M.Ch. (Oxon.), F.R.C.S. 1938. H. K. Lewis and Company, Limited, London. Pp. 18, with 38 illustrations. Price, 4s. 6d.

THE book deals with the problem of educating a child to speak correctly after an operation for cleft palate. It is a fact that in India, in almost all cases, a child after an operation is left to adjust for himself. There is no properly organized speech-clinic to help him to overcome his speech disabilities. In India such cases are extremely difficult to handle if we remember that most of the patients have already formed bad habits of speaking through the nose before an operation takes place. With younger children the task is much easier.

Dr. Oldfield has rightly stressed the value of daily and systematic practice in corrective exercises under the guidance of a competent speech-trainer. He has, of course, invited the co-operation of the parents. But the matter is so highly technical that too much dependence upon the home will not bear any good result.

The main principle dealing with speech-correction of a case with a false palate lies in the exercise of the soft palate. The different games suggested by the author will enable such children to get the necessary exercise through games. For older patients such games will not, however, have any appeal. Besides the games suggested I would advise active and direct exercise of the soft palate by moving it and keeping it stationary to command.

The description of the speech sounds given by the author is very elementary and the reviewer is also rather sceptical as to how far the parents may be benefited by it.

The book is well printed and bound and has 38 illustrations.

S. N. B.

Abstracts from Reports

LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE (UNIVERSITY OF LONDON) INCORPORATING THE ROSS INSTITUTE: REPORT ON THE WORK OF THE SCHOOL FOR THE YEAR 1936-37

THIS report has grown so much in size with the ever-increasing scope of this institution that now it is not possible to abstract it adequately in the space available. We have accordingly had to be content this year with quoting a few paragraphs from the general report of the Dean which give an outline of the more important work carried on at the London School.

A new departure is the issue of the report of the Ross Institute of Tropical Hygiene in the same volume. Hitherto this appeared as a separate report. Our abstract of this report is confined to a few passages from the work of this Institute which refers to the work in India only, but it should be recognized that similar work is being carried on by it in many other parts of the world.

The Medical Research Council have renewed the fellowship held by Professor Sir Rickard Christophers until September 1938, thereby enabling the board to maintain the malaria research unit in its present form for a further year. Another of the Medical Research Council's workers, Dr. T. Bedford, who last year was granted academic status as a lecturer in the School, has been recognized as a teacher of the University. We have welcomed the opportunity during the year of arranging a preliminary period of study for a junior fellow appointed under the Council's scheme for fostering research in tropical medicine through their Tropical Medicine Research Committee.

In July the Department of Scientific and Industrial Research offered to the School a substantial annual grant towards the cost of the researches in progress in Professor Raistrick's division on the biochemistry of moulds. The offer was gladly accepted, not only because it ensures the continuation of an important piece of work, but also because it establishes contacts which may be of the utmost value to the School.

The School was greatly honoured by the presence of the Right Hon. the Earl of Athlone, K.G., at a Reception held on Wednesday, 9th June, to commemorate Sir Patrick Manson and Sir Ronald Ross. A collection of original notebooks and similar material relating to Manson and Ross was displayed, and members of the staff arranged an interesting series of exhibits illustrative of the work of various divisions. The School has been honoured during the year by visits from H.H. the Sultan of Selangor and the Maharaja of Darbhanga. Other visitors have included a party of scientists from South America (Professor Sordelli, Professor Eugenio Suarez, and Drs. Hormaeche and Gerardo Varela), who spent a week in the School in the course of their tour of Institutes of Hygiene.

A course on mental deficiency, designed to enable medical practitioners to secure recognition by the Board of Education as certifying officers under the Mental Deficiency Acts so far as elementary school children are concerned, was held in the School for the first time in February, with the co-operation of the Central Association for Mental Welfare. It was open to members of the public health class, and to other persons such as school medical officers employed by local authorities. All available places were filled. The course was an unqualified success, and it is hoped to repeat it in future years. The thanks of the School are due to the Central Association for Mental Welfare, particularly for their assistance in arranging the practical work of the course; and to the lecturers who assisted—Dr. Tredgold, Dr. Williams, Dr. May Smith, and Miss Fildes. Two new courses in psychology and physiology applied to industry have been sanctioned by the board and one, a short intensive course for persons already engaged in industry, will be held between 7th and 18th February, 1938. It is intended primarily for members of the supervisory staff of industrial firms, but it is hoped that it may be of interest also to probationary factory inspectors and post-graduate students in engineering. The other course will last a full academic year, and is designed for persons who desire to study some of the applications of psychology and physiology to industrial problems with a view to preparing themselves for appointments in connection with personnel management, welfare work or factory inspection.

The usual course on tropical hygiene for non-medical men and women was held in December, and the course for naval surgeons in January. A course for laymen on

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the control of malaria was organized by the Ross Institute in June, and was attended by 113 persons, chiefly planters and mining engineers. One aspect of the co-operation between the Ross Institute and laymen in matters of health in the tropics is well illustrated by the fact that, in each of three years, this course has been attended by an average of considerably more than a hundred persons. The Trustees of the Pilgrim Trust in their annual report for 1936, in connection with the grant which they had made to the School in aid of special researches, referred to this side of the work of the Ross Institute in the following terms: 'Since 1933 the Ross Institute has been incorporated in the London School of Hygiene and Tropical Medicine (University of London), and its work at home as well as overseas has already offered striking illustrations of successful co-operation between scientist and layman through its Industrial Advisory Committee'.

Professor G. S. Wilson was a member of a group organized by the Health Section of the League of Nations to study the conditions governing the production and distribution of milk in the countries of Western Europe with a view to discovering how far it is possible to implement the recommendations of the League Nutrition Committee that more milk should be made available for infants and for other sections of the population. A report on the investigation is in the press, and will be issued as a League publication. In June Dr. G. P. Crowden attended a conference at Geneva organized by the League of Nations Commission on the hygiene of housing. With the assistance of a grant from the Board of Management, Dr. Hamilton Fairley and Mr. R. J. Bromfield spent six weeks during November and December studying blackwater fever in Macedonia. Dr. Fairley found blackwater fever to be remarkably prevalent, and he reports that Macedonia is a peculiarly favourable area for the study of this disease. His work has confirmed the presence of a new blood pigment in cases of blackwater fever, the discovery of which was mentioned in last year's report. Dr. V. B. Wigglesworth was enabled by the award of a Fellowship from the Rockefeller Foundation to spend six months working in the laboratory of Professor A. Krogh in Copenhagen; and Dr. A. E. Oxford spent some weeks in the laboratories of Professor Ph. Biourge at the Institut Carnoy, University of Louvain, Belgium. Dr. J. J. C. Buckley, Milner Research Fellow, has continued in the Malay States his investigations on the life history of onchocerciasis in cattle; and Dr. Alan Mozley, Wandsworth Scholar, began in January a survey of the molluscan carriers of bilharzia in East Africa. Dr. G. C. Ramsay, Principal of the India Branch of the Ross Institute, spent the greater part of the year in India; and Major H. Lockwood Stevens, Organizing Secretary of the Ross Institute, proceeded to India in order to explore the possibility of reorganizing and extending the India Branch. Dr. R. Svensson visited Nyasaland under the auspices of the Ross Institute, and in July he started on an extensive tour of West Africa in order to study the use of anti-larval oil in that area.

Dr. G. Carmichael Low, Senior Physician to the Hospital for Tropical Diseases, and Director of the Division of Clinical Tropical Medicine in the School, retired on 30th September, 1937. Dr. Carmichael Low joined the former London School of Tropical Medicine, which then occupied premises at the Albert Docks, in 1899, and he has been continuously associated since that date with the School of Tropical Medicine and with its successor, the present School. He will be greatly missed, and his colleagues hope that he may continue to enjoy a long period of fruitful activity.

The School has sustained a great loss in the death of Professor J. G. Thomson, a member of the staff of the old London School of Tropical Medicine since 1914, and Director of the Department of Protozoology in this School since its foundation. Professor Thomson's scientific attainments were everywhere recognized, and he had a great and well-deserved reputation as a teacher. No member of the staff was held in higher regard by the students.

Reports contributed by the heads of divisions and departments give an account of the teaching and research work undertaken in the School during the year. The joint researches of the Divisions of Bacteriology and Biochemistry have made satisfactory progress. Chemical fractions which appear to have effective immunizing powers have been isolated from the organisms of typhoid fever, of whooping cough, and of cholera, and from certain strains of hæmolytic streptococci, and a point has been reached where the practical application of the results obtained with some of these organisms is within view. The work appears to be of the utmost importance, and indeed it is not too much to say that it will give a new direction to practice in relation to the whole group of infectious diseases. Collaborative work between the Divisions of Bacteriology and Epidemiology has been continued on experimental epidemics in mice. Experiments at present in progress are designed to study the effects of variations in the duration of exposure to risk. The work is linked with that of Dr. Marion Watson, who, with the assistance of a grant from the Medical Research Council, is studying the effect of diet on the fertility, survival, and growth of mice and on their resistance to infection.

Experiments with various diets have confirmed the previous finding that the resistance of mice to infection by *Bact. typhimurium* is influenced by the diet on which mice are bred and reared.

The report of the Department of Entomology includes an account of work on the biology of the bed-bug. The investigation is being financed by the Medical Research Council, who have appointed a committee to study the insect with a view to devising means of controlling it.

Among matters referred to in the report of the Division of Bacteriology may be mentioned a study carried out by Professor Wilson in collaboration with Dr. F. C. Minett, of the Royal Veterinary College, and Mr. H. F. Carling, of the Berks and Bucks Joint Sanatorium, on the relative value of raw and of pasteurized milk for the feeding of calves. The results suggest that pasteurized milk is not inferior in nutritive value to raw milk. Professor Wilson has been responsible during the year on behalf of the Ministry of Health for examining samples of methylene blue specially prepared for the purpose by Imperial Chemical Industries, Ltd., with a view to discovering how far the chemical and the biological methods of standardization are in agreement. The work has been undertaken in connection with the new methylene blue test for the grading of raw milk. Dr. I. M. Asheshov, working in the Division of Bacteriology with a grant from the Medical Research Council, has pursued his investigation of the effect of bacteriophage in experimental infections. His findings constitute the first clear demonstration that a bacteriophage may exert an effective protective action in an experimentally infected animal. Dr. Asheshov left the School in September on his appointment as Associate Professor of Bacteriology in the University of Western Ontario.

In the Division of Biochemistry research, which is of considerable industrial importance, has been continued on the biochemistry of the lower fungi. Dr. Lucy Wills, the holder of a Lady Tata Memorial Fellowship, has extended her studies in anæmia in collaboration with Dr. Clutterbuck. They have been able to separate a factor curative in nutritional macrocytic anæmia from the liver principle curative in pernicious anæmia, and have studied its chemical nature and its relation to the vitamin-B complex.

In the section of Industrial Physiology work, which is likely to be of considerable practical importance, has been carried out on an air-conditioned cubicle suitable for use in tropical bungalows. The cubicle, which is portable, is constructed of light-weight material effectively insulated and, with a small air-conditioning plant, is capable of reducing tropical temperatures and humidities to reasonably comfortable conditions.

The Institute of Agricultural Parasitology has continued, at Winches Farm, St. Albans, and elsewhere,

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investigations on the prevention and treatment of helminth diseases: parasites of plants of economic importance, including potatoes, oats, tea; parasites of farm stock, of poultry and game, and of horses.

REPORT OF THE ROSS INSTITUTE OF TROPICAL HYGIENE

Since the publication of the last report, the Ross Institute Standing Committee has lost its Chairman and Vice-Chairman, Sir Austen Chamberlain and Sir Charles Campbell McLeod. The passing of these two great men was a loss not only to this Institution as a whole, but to the Empire. However great the calls from other quarters, they always found time to meet the members of the staff of the Institute, and their advice on our problems and difficulties was invaluable. This close contact has made their loss something very personal to the Institute.

Sir Harcourt Butler accepted the office of Vice-Chairman of the Standing Committee, and at his request the selection of a Chairman has been delayed for the time being.

During the year the Committee has been strengthened by two new members, Sir Thomas Stanton, Medical Adviser to the Colonial Office, and Sir John Megaw, Medical Adviser to the India Office.

The director was responsible for the course in tropical hygiene given to candidates for the Diploma in Tropical Medicine and Hygiene.

ROSS INSTITUTE IN INDIA

During the past year the Deputy Director, Dr. G. C. Ramsay, occupied himself, as usual, mainly with visiting tea estates in Northern India, but he also found time to visit a number of tea estates in Southern India, jute mills in Bengal, sugar factories in Bihar, cotton ginning factories in Sind, and a manganese mine in the Bombay Presidency. It is gratifying to record that in January 1937, Dr. G. C. Ramsay was created a Companion of the Indian Empire.

To place the work of the Ross Institute in India on a solid scientific foundation, the Ross Institute has financed, wholly or in part, and for longer or shorter periods, a number of field research stations. They have been placed under medical men engaged in estate practice. For their supervision, the Institute is specially indebted to Drs. D. Manson, G. Fraser, C. C. Hamilton in Northern India, and Dr. Measham in Southern India. The success of the work of the Ross Institute in India is to no small extent due to the valuable co-operation received from these and other medical men. Since the India Branch was formed, no fewer than 350 Indian malaria surveyors and laboratory workers have been trained at our centres, and absorbed in industry.

There are some 40 known anopheles in India, yet only a few are of economic importance. In Northern Bengal and Assam, the only malaria-carrying mosquito of importance is *A. minimus*, which lives in slow running water. In the jute mill areas near Calcutta, the harmful mosquito is *A. philippinensis*, which breeds in tanks. In Bihar *A. culicifacies*, which breeds in pools, is the principal carrier of malaria. In Southern India *A. fluviatilis*, which breeds in the grassy edges of hill streams, is the important carrier of malaria in the higher malarial areas, up to say 3,000 feet. But at 1,000 feet *A. culicifacies*, breeding in pools, in river beds, has been found infected in numbers great enough to make its control a necessity. Investigation is being carried on in eight different centres, and in time it is hoped the problem may be clearly defined. It will then be possible to control malaria with certainty and at a minimum cost. Fortunately both *A. minimus* and *A. fluviatilis* can be controlled by preserving jungle or growing shade, methods which are inexpensive and permanent.

It has been felt for some time that the Ross Institute in India should have a larger staff so as to ensure one man being available at all times. In order to see how far Indian industry, which has not hesitated to ask assistance, would be prepared to finance an extension of the staff and work of the Ross Institute and place it on a permanent basis, Major H. Lockwood Stevens visited India and interviewed the heads of many of the leading firms in Calcutta and Bombay. Although most of the heads of firms had changed since he was last in India, his visit was welcomed, and the discussions helped to define the position. The plan suggested received so much favourable support that there is reasonable hope that the remaining difficulties will be overcome once a permanent Ross Institute Committee has been created in Calcutta.

BENGAL ANTI-MALARIA CO-OPERATIVE SOCIETIES

The excellent work which is being done in villages in Bengal under the pioneer of the movement, Rai Dr. G. C. Chatterjee Bahadur, has been mentioned in previous reports. During his visit to India, Major Lockwood Stevens had an opportunity of revisiting some villages in Bengal where the society is operating, and of having several discussions with Dr. Chatterjee. Major Stevens also presided at the Annual General Meeting of the Societies in Calcutta, held on 24th January, 1937. The late Sir Charles McLeod presided on two occasions at the Annual Meeting, as also has Sir Malcolm Watson. Sir Ronald Ross himself attended the Annual General Meeting in 1926.

The result of fostering interest in the prevention of malaria in villages by the Societies has been general uplift of the village community, and it has led to the development of small holdings to such an extent that compared with a few years ago the whole outlook of some villages has changed. At Sukchar, a few miles from Calcutta, Dr. Chatterjee maintains a model farm in which he demonstrates the control of mosquitoes in village tanks by breeding fish for food, and the conversion of all waste products into manure by a simple process of composting. He also shows how a large family can be maintained on a relatively small garden. In teaching the villagers he shows that the prevention of malaria in rural areas, village uplift, rural sanitation, and agriculture naturally go hand in hand.

The thanks and appreciation of all members of the Societies are due to Dr. A. N. Mitra, Assistant Secretary of the central body, who has helped Dr. Chatterjee for many years. In the Director's opinion, work such as Dr. Chatterjee has stimulated in Bengal is one of the methods by which the rural problems of India could be solved.

The Director has renewed pleasure in recording the happy relationship that exists between the Calcutta School of Tropical Medicine and the Institute. Not only have we collaborated and so avoided overlapping of work, but it has been suggested that accommodation will be made available for our staff in India to make its headquarters in the School. Various members of the staff have had the pleasure of seeing Colonel Chopra, Director of the Calcutta School, on several occasions when he has been on leave; the discussions have been of the most cordial kind, and animated by a keen desire that each and every department of the two Schools should work together and give each other every possible help. It is hardly necessary to stress the value of co-operation between these two bodies in their work for the welfare of India.

ANNUAL REPORT OF THE DIRECTOR OF THE SOUTH AFRICAN INSTITUTE FOR MEDICAL RESEARCH FOR THE YEAR ENDED 31ST DECEMBER, 1936

THE past year has been one of more than usual activity, with the result that several departments are finding increasing difficulty in carrying on their work in the space at their disposal, and no relief is possible in the present buildings.

DEPARTMENT OF BACTERIOLOGY

Pneumonia.—The bacteriology and epidemiology of pneumonia and other allied acute respiratory diseases occurring in local mine natives are the subjects of continuous study. As a result of these investigations, the pneumonia vaccine issued for prophylactic purposes

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comprises the prevailing bacterial flora on the Witwatersrand. Each mine desiring to employ the prophylactic vaccine is studied as a separate entity to ensure the provision of a representative 'community autogenous vaccine' for that particular mining community of natives. It was found this year, however, that the bacterial divergences in the various communities were not sufficiently marked to warrant the issue of special and separate vaccines. The general vaccine as issued has been sufficiently comprehensive for the purpose.

The use of prophylactic pneumonia vaccine is increasing on the mines, and a number of satisfactory results continue to be recorded.

Opportunity was takn of their presence in Johannesburg to examine a number of Bushmen who were brought to the Empire Exhibition; the bacterial flora of a number of these people, who were suffering from minor respiratory maladies, was investigated. No unusual finding was recorded.

Pneumococcus infection in Europeans and non-mining natives.—In addition to the work on mine natives, a study was made of the pneumococcus type distribution in the European population as well as in the non-mining natives. The specimens examined in this connexion were derived from sufferers from the various forms of pneumonia as well as from pneumococcus infections other than pneumonia. This pneumococcus type survey is being continued.

Pneumococcus meningitis.—Specimens of cerebro-spinal fluid in cases of pneumococcus meningitis, both in Europeans and natives, provided a relatively large number of specimens submitted for special study. These were investigated from the pneumococcus type-distribution point of view. From sixty specimens of cerebro-spinal fluid in cases of pneumococcus meningitis, the pneumococcus was recovered and typed, 43.3 per cent of the pneumococci belonged to Groups 'C', 'B' and 'E' (= types I, II and III), and 56.7 per cent to other groups.

Typing of the pneumococcus.—The 'Quellung' phenomenon is now being utilized for identifying the different types. By this means a rapid 'pneumococcus-typing service' for clinicians is now provided, a service which is being used by an increasing number of medical men who have cases of pneumonia in their care.

Streptococcus studies.—The question of the streptococcus types occurring locally has been given much consideration. A considerable number of strains of the hæmolytic streptococcus isolated from a variety of human sources have been typed, and all have been shown to belong Lancefield's group 'A'.

Cerebro-spinal meningitis and the meningococcus.—A study has been made this year of meningococcus meningitis from the bacteriological standpoint. A portion of every specimen of cerebro-spinal fluid received for routine examination at the Institute is diverted to these laboratories for special investigation.

Strains of the meningococcus are now being typed under another system. This has been done to simplify the classification of the meningococcus with its ill-defined type-divisions. The simple agglutination test has been substituted for the more laborious agglutination-absorption test, which for many years was carried out in these laboratories. This latter test has not, in recent years, been found to give the more clear-cut results which were at one time obtained. The more complicated test, therefore, does not seem to be warranted any longer. This curious change in the meningococcus has been also noted in other countries where the question has been studied.

The relation of the meningococcus strains to therapeutic serum production is of considerable importance to the Institute serum department and much careful study has been undertaken in collaboration with that department in the selection of suitable organisms to provide the most adequate antigen for the preparation of an antigenically comprehensive polyvalent antiserum in horses. These efforts have been justified, as, at present, the anti-meningococcus serum produced is satisfactory in its agglutinating power against meningococcus strains isolated from current cases of the disease; but more important, the case-mortality rate in cerebro-spinal meningitis locally has shown a significant drop.

Plague.—A noteworthy feature in the plague position is an apparently steady diminution in the virulence of the strains of *B. pestis* obtained from both human and animal sources. One line of evidence pointing in this direction is as follows: All positive results are originally obtained either by guinea-pig inoculation or by culture from material received; these are checked by guinea-pig scarification; a few years ago such guinea-pigs usually died in from five to seven days, now they usually live ten or twelve days before succumbing to the disease or, not infrequently, they survive and recover, after development of a bubo, but without further spread of the disease.

South African strains have never been obtained with a virulence equal to that of some Indian strains, of which it has been reported that a dose of less than 100 organisms is regularly fatal for rats in three days, nevertheless, until a couple of years ago, almost any local strain could be counted upon to be fatal for a rat within that period in a dose of about five million organisms. Now few strains are ever fatal in such a dose and none are regularly so.

It might be thought that recently increased resistance in the local rate was the key to the loss of virulence, but the easy explanation of postulating increased resistance in the rats cannot be accounted for by race immunity through infection, because there has never been plague amongst the rats of Johannesburg which have been used throughout for test purposes here.

Tuberculosis.—What part does infection with bovine tubercle bacilli play here in the production of tuberculosis in human beings?

In attempting to answer this question by the identification of the type of tubercle bacilli present in tissues or discharges, an appeal has been made to practitioners throughout the Union to send material from suitable sources for investigation. As infection with bovine strains of bacilli is most commonly met with in young subjects and in gland, bone or joint tuberculosis rather than in pulmonary tuberculosis, material from such sources has been mainly solicited. The response to the appeal has not been as large as had been hoped for.

So far, the investigation is entirely negative as regards indication of infection of human beings from bovine sources. The number of cases is, however, too small to be of any great significance.

DEPARTMENT OF INDUSTRIAL HYGIENE

Dust from the lungs and mass distribution of particles.—The recovery of dust from the lungs of those who have been exposed to the underground air-borne dust of the Witwatersrand gold-field has been continued. No advanced cases have been studied, and those dealt with fall into three types: (1) Early clinical silicosis; (2) Fibrosis of silicotic type found on examination of lungs after autopsy; (3) No evidence of silicosis either during life or after autopsy.

When there is simple silicosis there is a relation between the mass of dust recovered and the amount of fibrosis. As great a mass of dust may be recovered from lungs showing no evidence of silicosis as from lungs showing a mild clinical silicosis. In the absence of silicosis there is no obvious relation between duration of exposure and mass of dust recovered. One cannot but be impressed by the experience that, over a considerable number of cases, one finds a relation between the mass of dust recovered and the amount of damage done to the lungs.

It is possible that overmuch importance is being attached to the ultra-small particle, say, particles of 0.8 microns and less which contribute the main *number* of the particles in the air-borne dust. The requirements for an index of dust-hazard are determined by physiological criteria and not by deductions based on physical and chemical characters or by the results of

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experiments on animals secured under conditions remote from those experienced underground. It is our experience on the Witwatersrand that a reduction in the mass of the air-borne dust, a mass chiefly contributed by particles of round about 2 microns, is associated with a fall in the dust-hazard. Our gravimetric sampling, which takes no account of ultra-small particles, and our konimeter sampling, which take but little account of them, yet appear to afford a tolerable assay of our dust-hazard. Present experience suggests that if we had only ultra-small particles in their present concentration in our underground air, there would be very little silicosis, and what there was would take a long time in the making and be almost confined to the particularly susceptible subjects.

It has been the experience of the Miners' Phthisis Medical Bureau that 'susceptibility' is related rather to an infective element coming into play early than to special sensitivity to dust invasion.

Biochemical Department

The inquiry into native edible plants has been continued, and though the number of new specimens received has been far less than in the previous year, it included a few of considerable interest. Most of the plants have now been identified, and progress is being made with the preparation of a detailed report.

At the present time there is a widespread impression that vitamins are very delicate substances, and are almost totally destroyed when a foodstuff is cooked.

Our own conclusions, based mainly on work done in this laboratory, are as follows:—It is known that the effect of heat in itself on solutions of ascorbic acid in distilled water, even after 15 minutes' boiling, is comparatively small, but contact with iron or copper salts leads to considerable destruction even in the cold. This is probably one reason why finely chopped raw green leaves may lose so much of their activity, even without any cooking at all, if they are allowed to stand.

It was found that even under the best conditions of cooking, very considerable losses of activity may occur when green vegetables are allowed to stand before being consumed; this loss is presumably due to atmospheric oxidation and to the destructive action of the metals already referred to.

The practical conclusions to be drawn from all this are that when it is desired to conserve antiscorbutic activity, green vegetables should be cooked in the minimum of water or preferably steamed, potatoes should be cooked in their jackets, aluminium or enamelled ware should be used in preference to copper or iron, and cooked and even raw vegetables should not be allowed to stand for longer than is absolutely necessary before being served. Pressure cooking was also found to be destructive of ascorbic acid.

The unavailability and expense of fresh clean milk in certain areas of this country, more especially during the dry season, led us to consider whether any possible alternatives might be available. Soya bean 'milk' has attracted a considerable amount of attention in some countries, but it seems unlikely that it would attain much popularity here. Experiments made with a view to utilizing commercial quality dried milk powders met with fair success, the difficulty, of course, being to secure satisfactory emulsification; it was concluded that quite a satisfactory and nourishing drink can be made from this source at a cost, when supplied in bulk, approximating to half that of fresh milk. The liquid replaces milk in cooking, and preliminary reports of its use by several authorities who agreed to give it a trial have been favourable. It is not, of course, claimed that such a product is the equal of clean fresh milk, but it is certainly palatable, safe and inexpensive, whilst the nutritional value still remains at a high level.

[The work of the Pathological Research Department appears to have been occupied in experimental cancer research.]

Department of Entomology

Further evidence on the effect of anti-adult measures on salivary infection rates in mosquitoes.—The lack of vectors and comparative absence of malaria during the season 1935-1936 has prevented a continuation of experiments on the effect of anti-adult measures in the control of malaria. In the extreme north of Zululand, however, an area was found with some malaria, and it was decided to test the effect of spraying on glandular infections in *Anopheles gambiae* and *A. funestus*. No control work had been done here before. The area was divided into two parts, one half was sprayed with an insecticide three times a week for one month and then five times a week for another two months; the other half was left as a control. The two areas were some five miles apart, but intervening huts did exist and there was undoubtedly some over-flow of infected insects into the treated area.

The results of infections in the two areas for the period March–May were as follows:—

	Untreated area		Treated area	
	Number dissected	Glandular infections	Number dissected	Glandular infections
gambiæ ..	372	19	130	1
funestus ..	594	12	268	4

It is to be noted that all the infected insects in the treated zone came from the extreme boundary of the area where overflow from the untreated area presumably took place. No infected insects were ever found on the opposite boundary beyond which there were no huts at all. Taking these facts into consideration, the results are encouraging.

Carry-over of malaria from season to season in Natal and Zululand.—The question of the carry-over of malaria from one season to another is of some importance. It is quite possible that measures founded on a sound knowledge of what happens during the off-season may conceivably reduce the chances of infection in summer.

From information so far gathered it is concluded that there is probably a complete cessation of mosquito-borne malaria in winter in purely *gambiæ* areas and that malaria is carried over from one season to another in the human host. A very low infection rate amongst *gambiæ* in winter is not to be entirely discounted. Lack of material sent in for dissection prevents us from being definite on this point.

Mosquito infections.—Funestus has been found infected all the year round as in the Transvaal.

Spleen rates.—These are relatively much higher at the end of winter. Moreover, it is possible to show that children near the breeding places have a higher rate than those living away from streams and rivers. From these considerations it is obvious that there is active mosquito-borne malaria in winter in *funestus* areas.

ANNUAL REPORT ON THE CIVIL HOSPITALS AND DISPENSARIES IN THE CENTRAL PROVINCES AND BERAR FOR THE YEAR 1936.

BY LIEUT.-COL. J. M. R. HENNESSY, I.M.S., OFFG. INSPECTOR-GENERAL

At the close of the year 1935 there were actually 338 hospitals and dispensaries at work, and not 339 as wrongly shown in last year's statement. During the year under report, seven dispensaries were opened, four closed and one transferred, leaving 340—164 rural and 176 urban—dispensaries at work on the 31st December, 1936.

Taking into account the number of dispensaries at which the public ask for free attendance, the average

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area covered by a dispensary comes to 467 [476]* square miles while the average population works out to 72,466 [73,846]*. Classifying the figures further into urban and rural areas, the average population served by a dispensary comes to 15,990 and 126,869, respectively. These figures speak for themselves about the inadequacy of medical relief, especially in rural areas in the province. Financial depression, however, precludes the possibility of undertaking schemes for opening new dispensaries, and, as stated by my predecessor in last year's report, unless the condition of raising a local contribution of Rs. 8,500 on account of endowment fund and half building charges is relaxed, no substantial progress is possible.

Mayo hospital.—The comments on the general condition of the hospital buildings and other necessities made in the last year's report still hold good. The entire institution requires re-building and enlarging to bring it up to modern standards. Necessary proposals have already been submitted and are under the consideration of Government.

Schemes financed from the Government of India grant for rural development.—During the year 1935-36 a sum of Rs. 15,000 was allotted for cheap-plan dispensary buildings in villages. The schemes sanctioned amounted to Rs. 14,750 and they include cheap-plan dispensaries at Atnair and Mohta in the Betul district, Kurkheda and Bhamragarh in the Chanda district, and Mounda in the Nagpur district. The scheme for the opening of the dispensary at Mohta was sanctioned after the close of the year under report. The expenditure generally represents non-recurring grants to the district councils to meet half of the cost of construction of these cheap-plan dispensary buildings.

The total number of patients treated, both in- and out-door, stands at 3,332,292 [3,107,107], showing an increase of 225,185 over the past year. The increase is noticed in all the districts excepting Mandla, Hoshangabad, Nimar and Raipur. Of the total number treated, 3,240,984 [3,024,565] were treated in the general hospitals and dispensaries and 91,308 [82,542] in the female hospitals. The above statistics of attendance and work done in the medical institution referred to give further indication of the growing appreciation by the public of their activities.

The number of cases treated for malaria during the year showed an increase of 97,950 over the figure of the past year and the increase was noticed in all the districts, excepting Jubbulpore and Nimar. The other diseases showing an increase over the figures of the past year were chiefly as follows :—

Diseases of the ear (18,196), diseases of the eye (17,318), diseases of the teeth and gums, excluding tumours (15,585), diseases of the respiratory system other than pneumonia and tuberculosis (15,522), diseases of the intestines, excluding diarrhœa, dysentery and tumours (11,366), diarrhœa (9,758), diseases of nervous system (9,740), pyrexia of uncertain origin and other diseases due to infection (9,166), injuries, general and local (8,663), amœbic dysentery (5,971) and scabies (5,803).

The number of cases treated for smallpox during the year was 460 [462], of which 105 were vaccinated, 170 not vaccinated, while the vaccinal condition of the remainder was not known.

Deputy Commissioners comment on the progressive reduction and unpunctual payment of contributions by local bodies. The Commissioner, Nagpur Division, states that he agrees to the suggestion made by the Deputy Commissioner, Wardha, that it should be made obligatory on local bodies to devote a certain percentage of their income to medical relief and that a contribution once fixed for a local hospital should not be varied without the sanction of Government.

Anti-rabic treatment was carried out as usual at the six existing centres at Nagpur, Jubbulpore, Raipur, Saugor, Hoshangabad and Akola and a new centre was opened at the Main Hospital, Wardha. The number of patients treated at all these centres during the year was 1,564 [1,730]*. The local Government was also pleased to sanction the opening of an anti-rabic treatment centre at Chhindwara which is expected to start functioning shortly.

* Figures in square brackets refer to previous year.

REPORT ON THE PUBLIC HEALTH ADMINISTRATION OF THE CITY OF RANGOON FOR THE YEAR 1936

CLIMATIC conditions throughout the year were more or less the same as in previous years with the exception of rainfall which was the highest for the last 30 years. The city was comparatively free from infectious or notifiable diseases when compared with the previous year. There were 232 deaths from these diseases against 425 in the previous year and against the average of 469 deaths from such diseases for the last ten years. The position in regard to cholera, plague and smallpox was satisfactory. There were only 18 deaths from cholera which accounted for 69 deaths during the previous year, the average number of deaths for the last ten years being 49. Two deaths from cholera occurred amongst the imported cases. Similarly the number of deaths from smallpox was only 21 as compared with 172 deaths in the previous year and the average of 142 deaths for the last ten years. The number of deaths that occurred from smallpox in imported cases was 8. The incidence of plague continued to be low—14 during the year under review. There were 17 deaths from plague during the year 1935, the average number of deaths during the last ten years being 90. One death from plague occurred amongst cases imported from outside.

There was no mortality from measles or chicken-pox, 123 cases of the former and 699 cases of the latter having been reported during the year as against 295 and 1,150 respectively during the previous year.

The number of deaths from cerebro-spinal fever was 5 as against 6 of the previous year, the average number of deaths during the last ten years being 5.

Sixty-two deaths were attributable to enteric fever as against 49 in the previous year, the average for the last ten years being 64. The number of persons attacked with this disease during the year was 183 as against 186 in 1935.

Diphtheria and puerperal septicæmia accounted for 14 deaths and 12 deaths as against 7 and 23 respectively during the previous year.

There were no deaths from typhus fever, 7 cases having been reported during the year as compared with 16 during the last year. Malarial fever caused 84 deaths as against 80 deaths in 1935.

The number of deaths from diarrhœa and dysentery increased from 444 in 1935 to 669 during the year under report, the average number of deaths from these diseases during the last ten years being 783.

The number of persons attacked with epidemic dropsy (including beri-beri) was 199 as against 610 during the last year. There were 86 deaths from these diseases during the year as compared with 81 during the previous year.

Tuberculosis continued to exact a heavy toll of mortality in the city, the number of deaths having increased from 952 in the previous year to 1,115 during the year under report, the average number of deaths during the last ten years being 873. The Buddhist community suffered the most, the Hindus and Mohammedans were the next and the Christians the last.

The decrease in the number of persons suffering from tuberculosis with rising incomes when considered with the facts as disclosed by the examination of the profession or occupation of those dying from tuberculosis is too significant to allow the effects of poverty and lack of nutrition to be ignored in any scheme that may be promoted for checking the ravages of this disease. The peak of the mortality curve of phthisis in Rangoon was reached in the year 1925. The years 1926 to 1930, which were marked by a downward trend, seem to coincide with the period when there were increased

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opportunities for employment. The mortality curve has been again rising from 1931 and this coincides with the period of depression and unemployment. It, therefore, appears that the growth of anti-tuberculosis institutions (dispensaries, hospitals and sanatoria) alone will not completely solve the problem of tuberculosis in Rangoon unless at the same time the social and economic aspects of the disease receive attention. An anti-tuberculosis society or association has long been overdue in Rangoon and it is earnestly hoped that public sympathy and charity will not long allow the postponement of the day when such a society comes into being.

The total number of deaths during the year increased by 198, there being 10,265 deaths during the year under report as compared with 10,067 deaths in the previous year. The death-rate was 25.64 as against 25.14 in the year 1935. The most important causes that contributed towards the rise of the death-rate were tuberculosis (+ 163), diarrhœa and dysentery (+ 225) and diseases of the respiratory system (+ 84).

Some of the foregoing remarks with regard to tuberculosis apply with equal force to respiratory diseases. Exposure and failure to have proper treatment in the early stages were additional factors in the causation of higher death-rate from these diseases. The increase in the number of deaths from diarrhœa and dysentery was to some extent attributable to the abnormal rainfall during last year. As death-rate is generally regarded as the criterion of the state of health of a community or locality, some comment with regard to the factors influencing it will not be out of place here.

Many cities in the East, particularly those in India and Burma, were, during the early part of this century, marked by a high death-rate chiefly owing to the prevalence of such dangerous diseases as smallpox, plague, cholera, malaria, diarrhœa and dysentery in epidemic forms. With the introduction of sanitary measures and the organization of public health services, the fall in death-rate has been phenomenal in some towns, chiefly those which happened to be situated at the gateways of trade and commerce, as the diseases already mentioned loomed large in the death returns and were definitely preventable. In Rangoon the death-rate came down from 47.57 per 1,000 in the year 1906 to 22.11 in 1933, the number of deaths from cholera having decreased from 330 in 1907 to 3 in 1932. Similarly, the number of deaths from plague decreased from 2,974 in 1906 to 9 in 1933. Although there have been periodic visitations of smallpox, the number of deaths in the various epidemics has been low. The epidemic of 1906 caused 1,035 deaths whereas the average number of deaths during the last five years was 155 and during the last year there were only 21. The number of deaths from diarrhœa and dysentery declined from 1,494 in 1908 to 444 last year. It will thus be seen that most of the diseases which accounted for a large number of deaths have been brought under control; at any rate the mortality they now cause is so low as hardly to have any appreciable influence on the death-rate which in port towns may be said to have reached a standard about which it will keep on fluctuating. This standard will naturally vary in different towns depending upon the climatic conditions, racial predisposition, composition and density of population, and economic status of the people concerned. The following table illustrates the point better and shows how the death-rate fluctuates near this hypothetical standard:—

	1932	1933	1934	1935	1936
Calcutta	25.0	29.4	28.7	28.5	31.0
Bombay	19.7	23.4	23.6	25.2	25.8
Madras	34.4	37.9	36.6	38.6	36.5
Colombo	24.6	27.1	28.6	29.9	27.2
Singapore	20.12	19.66	20.99	23.10	23.55
Rangoon	24.66	22.11	23.66	25.14	25.64
Burma (urban)	28.85	27.22	30.03	30.18	30.81

It will be seen that in spite of more attention being paid to public health matters in these places there has been a tendency for the death-rate to rise, thereby suggesting that there are some general factors operating all over these places such as trade depression, unemployment, malnutrition and lowered resistance to disease. This uniformity in the rise of death-rate at such distant places would be hard to explain on the theory of local causes alone.

With the control or elimination of the dangerous diseases that were responsible for a large number of deaths, by improvement in environmental sanitation, it appears that future reduction in death-rate to any marked extent can only be brought about by paying more attention to the social side of preventive medicine as envisaged in the maternity and child-welfare schemes, school hygiene and nutrition of the school child, anti-tuberculosis organizations for the relief of sufferers from tuberculosis, promotion of social hygiene, housing schemes particularly for labourers and working people, improved milk supply, the care of the aged and the unemployed, birth-control clinics, practical eugenic policy and sterilization of the mentally defective. Extension of water supply and underground sewerage system to the outlying parts and the closure of rubbish tips in the city will in their turn bring about improvement when these respective schemes come to fruition.

The infantile mortality rate (243.02) was lower than that of the last year (251.35) and was in fact the lowest on record. The mortality amongst the infants under the care of lady health visitors was 145.66 in spite of the fact that their activities were confined to those parts of the town where the standard of sanitation is low and the people poor. This indicates that the scope of maternity and infant welfare work can be profitably extended to those parts of the town not at present served by the health visitors.

ANNUAL REPORT OF THE EXECUTIVE HEALTH OFFICER OF THE CITY OF BOMBAY FOR 1936

The number of live births registered during the year was more by 5,971 than the number of deaths that took place in the city. This excess of births over deaths was equivalent to 5.1 per 1,000 population calculated on the census of 1931 and was recorded six times in succession. Before 1931 there was no such excess since 1866, the year in which birth records were instituted.

The number of live births registered was 35,905 being 1,477 more than in 1935 and 9,856 more than the average of the last ten years 1926–1935 and the highest on record since 1866. The birth-rate calculated on the census population of 1931 was 30.9 births per 1,000.

The total number of deaths from all causes was 29,934 being 645 more than in 1935, 3,575 more than the average of the last five years (1931–1935) and 2,650 more than that of the preceding decennium (1926–35). The death-rate per 1,000 of census population of 1931 was 25.8 as against 25.2 in 1935 and 22.2 the rate recorded for the decennium 1926–1935.

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There were only two deaths from plague during the year as against 1 in 1935 and 72 the average of the last ten years (1926–1935).

Smallpox was in epidemic form and caused 906 deaths as against 1,248 in 1935 and 913, the average of the last decennium (1926–1935).

Cholera was registered as the cause of five deaths (including three imported) against 13 in 1935 and 25 less than the average of the ten years 1926–1935.

Influenza was prevalent in a mild form in the city during the year and caused 71 deaths as against 72 in the preceding year and 84 the average of the last decennium (1926–1935).

The deaths from diseases of the respiratory system numbered 10,601 being 40 less than in 1935 and 726 more than the average of the last ten years (1926-1935).

Tuberculosis accounted for 1,993 deaths as against 1,929 in 1935 and 1,667 the average of the preceding decennium (1926–1935).

Ninety-one deaths were due to malaria, being six less than in 1935 and 127 less than the average of the last decennium (1926–1935). There were 1,332 deaths from ague and remittent fever as against 1,389 in 1935. The average number of deaths for the last ten years (1926–1935) from malaria was 218 and from ague and remittent fever 1,474.

The deaths among infants under one year of age numbered 8,946 against 8,455 in 1935 and 7,598 the average for the last ten years (1926–1935). The rate of infant deaths per 1,000 births registered was 249.1 as against 291.7 the mean of the preceding decennium.

Compared with the decennial average (1926–1935) the total number of deaths shows an increase of 2,650, the principal increase in the mortality being 726 under respiratory diseases, 601 under congenital debility and diseases of early infancy, 326 under tuberculosis, 202 under cerebro-spinal fever, 160 under diseases of the nervous system, 106 under enteric fever, 72 under dysentery, 54 under diarrhœa and enteritis and 44 under deaths due to violence.

On the other hand there was a decrease in the deaths under ague and remittent fever by 142, under malarial fever by 127, under plague by 70, under leprosy by 54, under puerperal state by 31, under cholera by 25 and under influenza by 13.

Prevention of infantile mortality

The work which is being done in Bombay for the reduction of infant mortality may be described under the following heads:—

(*i*) Visits by the municipal district nurses for the purpose of getting into touch with prospective mothers and for discovering cases of sickness especially among women and children and unvaccinated children; for enquiry into the condition of new-born infants; and for giving instructions by homely talks as to the care and rearing of children.

(*ii*) Attendance on confinements.

(*iii*) Provision of necessaries and comforts during the lying-in period.

(*iv*) Maternity homes.

(*v*) Infant welfare centres and infant milk depôts.

Municipal nurses.—The number of municipal nurses employed is ten, one being attached to each of the ten district registrars' offices. They visit daily the localities and the chawls inhabited by the poor and help to diffuse and popularize elementary knowledge of the principles of health and hygiene and to carry such knowledge into the homes and lives of the ignorant; they give advice on the prevention of disease and the care and up-bringing of infants and bring to the notice of the authorities unregistered births, unvaccinated children and cases of sickness; they also persuade prospective mothers to go to the maternity homes provided for them free. Where this provision is not taken advantage of, they attend on the women in their own houses providing them with bedding for their confinement, and with food in shape of milk and bread during the first seven days of the puerperal period. The visits of the nurses are frequently the means of bringing to the municipal dispensaries sick persons who would otherwise either not know the existence of the facilities provided or knowing would, through indifference and apathy, neglect to benefit by them. These visits are doing much good and are welcomed and appreciated by those for whose benefit they are paid.

The anti-tuberculosis measures

There are two special tuberculosis dispensaries for out-patients—one at the Sanitary Institute, Princess Street, and the other at 143, Foras Road.

The Turner Sanatorium at Bhoiwada Hill, Parel, has accommodation for 32 patients. Only early cases are admitted to this institution.

Each dispensary is in charge of a qualified tuberculosis officer, with a fully-trained nurse working under his direction. In addition to her duties at the dispensary, the nurse visits the homes of patients attending the dispensary and reports on the following form which is subsequently attached to the patient's case sheet :—

		Good	Fair	Bad
House	Situation ..			
	General condition			
	Ventilation ..			

		Male	Female	Children
Family	Number ..			
	State of health			
	Previous deaths			
Patient	Living ..			
	Diet ..			
	Habits ..			

Income of the household.

Number of inmates dependent on the patient.

During her domiciliary visits, the nurse distributes printed propaganda leaflets and advises patients and their relatives about ventilation, diet, clothing and general sanitation. The 'contacts' are brought to the dispensary for examination. Their record is entered on a special printed 'contact card'. The investigation of contacts is one of the most important functions of the dispensary.

Stegomyia index

Routine work of the malaria branch is not only confined to the control of anopheline variety of mosquitoes but it also devotes its attention to the breeding of all varieties of mosquitoes in the city. Since the commencement of the department, the record of breeding places of anopheline mosquitoes has been maintained throughout. No such record was kept in respect of other varieties until recently when on account of the importance of *Aedes ægypti* which is known to be the carrier of yellow fever a regular record of the breeding places of this variety of mosquito has been kept since June 1936. The stegomyia index which was found to be 0.1 in the beginning of June, reached its maximum which is 0.5 in the month of August and gradually declined and came to 0.03 by the end of December 1936. Thus the index is below 2 per cent which is the standard considered by the Government of India to be sufficient to ensure safety against an epidemic of yellow fever. It will be noticed that the breeding of stegomyia increases during the monsoon partly owing to the favourable conditions and partly on account of the increase in the number of temporary breeding places due to the collection of water in odd receptacles, in open yards, etc.

REPORT OF THE HAFFKINE INSTITUTE, BOMBAY, FOR THE YEAR 1936. By LIEUT.-COL. S. S. SOKHEY, I.M.S., DIRECTOR

General review

The institute continued to function during the year as (*a*) the centre for the manufacture of plague vaccine for the whole of India and of other prophylactic

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vaccines for the Presidency, (*b*) the Provincial Bacteriological Laboratory for the Bombay Presidency, (*c*) the centre for the manufacture of anti-rabic vaccine for Bombay Presidency and adjoining areas and treatment centre for Bombay city, and (*d*) a centre for research. Researches in plague and pharmacology were carried out with the generous assistance of the Indian Research Fund Association.

The demand for plague vaccine dropped somewhat during the year; 881,054 doses (*i.e.*, 2,643,162 c.c.) were issued as compared with 1,017,044 doses during the previous year. The lowered demand happily is due to lessened incidence of the disease, and not to any falling off in the popularity of the vaccine as a prophylactic measure. There were 23,873 attacks of plague in 1936 against 41,042 attacks in 1935. The demand for the vaccine continues to be high in relation to the incidence of plague.

The outbreak of cholera in the Presidency necessitated heavy demands on the institute for the supply of cholera vaccine and put a serious strain on the reduced staff. 705,621 doses of the vaccine were issued during the year. In addition, 16,381 doses of meningococcal vaccine and 5,746 doses of typhoid vaccine were issued.

The supply of reliable sera to Government hospitals at moderate prices has been a problem demanding solution for some time. About the middle of the year, the institute was called upon to undertake this supply. To meet the immediate needs, the institute has been fortunate enough in obtaining sera at very moderate prices from one of the leading serum institutes—State Serum Institute of Copenhagen. To keep the costs down still further sera are obtained in bulk and bottled at the institute. The problem can be met finally only by the institute producing its own sera. The matter is under investigation.

PLAGUE RESEARCHES

Plague vaccine.—Using his standardized quantitative method for measuring the virulence of the plague bacillus and his method for measuring the protective value of plague vaccines, Sokhey continued the researches on plague vaccine. The work has yielded some very interesting results. After confirming, by further work, his previous observation that broth vaccines incubated at 27°C. are more potent than those incubated at 37°C., he proceeded to investigate the problem as it affects agar vaccines. He finds that agar vaccines incubated at 37°C. are more potent than agar vaccines incubated at 27°C. He points out that the difference to a large extent is only apparent. Certain observations have led him to believe that the potency of a vaccine depends largely on the number of organisms and their size, *i.e.*, the bulk of organisms, in a vaccine. In the case of broth, the growth of organisms is self-limited, and the growth of the plague bacillus at 37°C. is much less than at 27°C. In the case of agar vaccines the number of organisms are varied at will and in all the experiments reported here the agar vaccines had equal numbers of organisms. But the size of the organism at 37°C. is larger than at 27°C. He does not think that the presence or absence of capsular material affects the issue, because Sokhey and Maurice have been able to show by straining that the capsule is present even when organisms are incubated at as low a temperature as 5°C.

Comparison of live avirulent vaccines and heat-killed vaccines has also yielded interesting results. In the case of broth vaccines, heat-killed vaccines incubated at 27°C. have proved to be more potent than live avirulent vaccines incubated at 27°C. or at 37°C. but in the case of agar vaccines, live avirulent vaccines incubated at 37°C. have proved to be much more potent than heat-killed vaccines. It is, however, to be noted that the order of potency of the best live avirulent agar vaccine was the same as that of the heat-killed broth vaccines incubated at 27°C.

The study of the effect of the method of killing of cultures on the potency of the resultant vaccines has produced results of biological significance besides providing indications of great practical value. Here broth and agar vaccines behave exactly alike and the temperature of incubation is the important factor. In the case of vaccines incubated at 27°C. the best results are obtained when killing is done by the application of heat at 55°C. for 15 minutes. Such a vaccine is about twice as potent as a vaccine killed by the addition of phenol (0.5 per cent) without the application of heat and about four times as good as a vaccine killed by the addition of formalin (0.025 per cent). Killing by the application of heat at 60°C. for one hour reduces the potency of the resultant vaccine to about $\frac{1}{7}$th of the potency of the vaccine killed at 55°C. for 15 minutes. The extraordinary phenomenon is that if the cultures are incubated at 37°C., the method of killing does not affect the potency of the resultant vaccines. This phenomenon is being studied further for a possible explanation. Indications are that the state of the bacterial protein is responsible for this phenomenon. When cultures are incubated at 27°C., the bacterial protein, in solution or otherwise, is still largely in a coagulable form, but when the cultures are incubated at 37°C., the protein breaks up into a form in which it is no longer easily coagulable. But if this process of breaking up goes further, as in the case of lysis with bacteriophage, it loses its antigenic property entirely, as was shown in the last report.

These are observations of considerable theoretical and practical significance and indicate further experimental work to finally decide the method of obtaining the most potent plague vaccine. It will be noticed that Sokhey has not been able to compare broth vaccines directly with agar vaccines on the basis of the bacterial content of the vaccines, as he has not yet successfully solved the problem of measuring the bacterial content of a broth vaccine, because during the long period of incubation organisms continue to go into solution. However, from the practical point of view, such a comparison is perhaps not necessary. The question of the 'best' vaccine will be solved by the production of a vaccine having the greatest possible protective power and the minimum of toxicity. This work offers hope of a final solution of the problem.

The work already indicates that when vaccines are made by growing the organisms in broth, whether a virulent strain of organisms is used or an avirulent one, whether the growths are incubated at 27°C. or 37°C. and whether the growths are killed by the application of heat (55°C. for 15 minutes), or by the addition of phenol (0.5 per cent) or by the addition of formalin (0.025 per cent), the difference between the best and the worst vaccine tends to be low, 1 to 7.5 (0.002 c.c. to 0.015 c.c.). But when the vaccines are made from growths on agar, and the same strains, the same temperatures of incubation and the same methods of killing are employed as in the case of broth vaccines, the difference between the best vaccine and the worst tends to be high, 1 to 100 (0.001 c.c. to 1 c.c.), and the best agar vaccine is not much better than the best broth vaccine. The issue will be decided by a measurement of toxicity of the vaccines.

This work raises another issue of interest, that is, the relationship between the serological reactions and the phenomenon of active immunity. Schutze, by serological studies, came to the conclusions that the incubation of plague cultures at 37°C. produced an antigen which was more readily effected by heat (heat labile) than the antigen developed by incubation at 27°C. Measurement of active immunity by the biological method shows that incubation of cultures at 37°C. produces more heat-stable vaccines than incubation at 27°C. In the case of cultures incubated at 27°C., 5°C. rise in the temperature of killing, *i.e.*, 55°C. to 60°C., reduces the potency of the resultant vaccine to $\frac{1}{7}$th, while the same increase in the killing temperature does not affect at all the vaccines incubated at 37°C. Preliminary experiments show that a vaccine made from a culture incubated at 37°C. even when heated at 100°C. for one hour retains considerable protective power.

The view that 'no dead vaccine whatever conferred satisfactory protection on guinea-pigs and wild rats'

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has also been investigated by Sokhey. He finds that this view also arose from defective experimental work and that heat-killed vaccines do confer a very high degree of immunity on those animals. Using a heat-killed vaccine, he has found that very high protection in the case of the guinea-pig, the wild rat and the white rat can be obtained with doses of 0.01 c.c., 0.025 c.c., and 0.025 c.c. respectively, and that even these doses are not the minimum protective doses, which, it appears, will be still smaller.

Anti-plague serum.—Work has been continued and the use of better methods of immunization has resulted in the production of a serum twice as potent as the serum produced last year which gave such encouraging results in the field test at the beginning of the year. Opportunity is awaited to test this new serum in the field.

Epidemiology of plague.—Pandemic of plague separated by four centuries or so is a well authenticated phenomenon. These pandemics have ravaged the world, have smouldered here and there for long or short periods and have then come to an end, as they started, of natural causes. The explanation of this phenomenon has always intrigued observers, but no adequate explanation has been forthcoming. The susceptibility of rats to plague was rightly believed to be an important factor, but no exact measurements could be made for lack of the knowledge necessary to prepare a constant standardized infective dose of plague for suitable laboratory experiments. The success at evolving a constant infective dose for the purpose and the present comparatively quiescent period after a severe pandemic in India offered a suitable opportunity of studying the phenomenon.

The results already reported have clearly indicated that the rats in localities where serious epidemics have raged are highly resistant to plague infection. In fact the resistance of the rats seems to be roughly proportional to the intensity of the epidemic of the locality. This resistance can be attributed to several factors. It has been believed that even when plague among human beings has come to an end in a particular locality, the disease continues to smoulder among rats and this continued mild epizootic gives the rats high resistance to plague. But the daily examination of a large number of rats caught in the city of Bombay has shown that this explanation is not correct. For the last two years, no rats have been found in the city that showed any signs of infection, yet the rat population of Bombay is very highly resistant. The other hypothesis was that rats during an epidemic in a locality acquired immunity and transmitted it to their young. Sokhey has investigated this phenomenon by using white mice. This animal has no natural resistance to plague and the young born to parents which had been fully protected against plague showed no immunity, indicating that acquired immunity is not transmitted.

During their observations, Sokhey and Chitre obtained rats from Dharamsala, a hill station in the Himalayas, where plague has not been known to have occurred during the present pandemic. Some of the rats obtained from this place showed high resistance to plague, indicating that there exist in nature strains of rats which are naturally immune or resistant to plague. The probable explanation of the end of an epidemic in a locality would seem to be that all or most of the susceptible strains of rats die out leaving behind naturally resistant strains. How do fresh pandemics or epidemics start? During the year these workers have made one observation which throws some light on this problem. During this investigation they worked entirely with the house rat (*Rattus rattus*) as it had been observed that this species of rat was the one chiefly responsible for the spread of plague to human beings. However, some workers had observed that in some localities the small field rat (*Gunomys varius*) had been responsible for the spread of the disease. Therefore a batch of *Gunomys varius* obtained from the city of Bombay was examined, and they were surprised to find that this species of rats was highly susceptible though the Bombay *Rattus rattus* was highly resistant. This observation is of great significance. If and when this species of rat becomes more numerous or replaces the house rat in human habitations, the stage would be set for a fresh epidemic. These workers consider it highly desirable that this question should be studied further. The fact cannot be overstressed that the phenomenon of plague is not yet fully understood and the present time is the most suitable one for further study. It is a comparatively quiescent period after a severe pandemic with just a few cases of plague here and there. These factors make the present period an ideal one for further study and any expenditure that may be incurred would be well worth it.

DEPARTMENT OF PHARMACOLOGY

During the year the department has been responsible for important research work. New synthetic anti-malarials have been in use for the treatment of malaria for some time. Plasmoquine was the first of these and though a large number of papers describing the clinical use of plasmoquine have been published, a complete study of the pharmacology of the drug had not been made. Dikshit investigated the pharmacological action of this drug and described the effects produced on different organs of the body after administration of large doses to experimental animals. His results show that plasmoquine affects most of the systems of the body but more particularly the circulatory and the digestive systems. The important action is the formation of methæmoglobin which leads to cyanosis and fatty degeneration of the liver. These actions are produced by administration of toxic doses of the drug.

As in the case of quinine, treatment of malaria during pregnancy by plasmoquine has raised a certain amount of controversy. Dikshit undertook to investigate this problem and his preliminary results tend to show that plasmoquine does not produce abortion in experimental animals, even when given in doses which are considerably higher than those used in therapeutics. It appears from his studies that, as far as continuation of pregnancy is concerned, plasmoquine would not in any way interrupt the normal course.

In view of the intended enactment of the necessary legislation for the control of the sale and manufacture of drugs, in India, the department has been making arrangements for the biological assay of drugs. Standards maintained at the National Institute for Medical Research, Hampstead, have been obtained and from them standards have been established for the institute. Some samples of tincture of digitalis were examined during the year. One sample was only 25 per cent of the standard strength. A sample of tincture of strophanthus examined had a potency of only $\frac{1}{10}$th of what it should possess.

The department is still on a temporary basis and is maintained by the Indian Research Fund Association. The value to the Presidency of such a department cannot be overstated and it is hoped Government will find means to put it on a permanent basis.

DEPARTMENT OF BIOCHEMISTRY

The department continued to be of value both to the workers in the institute for chemical aid in their work as well as to practitioners and hospitals for the examination of clinical material. In addition, the department has continued to work on establishing the normal clinical standards for Indians and is now engaged on nutritional research work.

DIAGNOSTIC DEPARTMENT AND DEPARTMENT OF PUBLIC HEALTH CHEMISTRY AND BACTERIOLOGY

As some of the city hospitals are now well equipped with their own laboratories, these departments are entrusted only with the work that they cannot carry out. Though the work is considerably less than before, these departments are still proving of great value. During the year the department examined over 8,000 specimens sent by hospitals and dispensaries and of these examinations for Wassermann reaction were 4,000.

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ANTI-RABIC DEPARTMENT

Since the Anti-rabic Department was opened in 1922, the popularity of the anti-rabic treatment has grown and in keeping with the policy of making the treatment freely available to the public there are now 69 treatment centres in the Presidency. Five of these were opened during the year. In 1922, 243 treatments were issued to the out-centres and 429 persons were fully treated at this institute, while during 1936, 5,259 treatments were issued to the out-stations and 2,331 persons were fully treated at the institute. All this has meant enormously increased work which has now grown beyond the capacity of the present staff.

Correspondence

A TIME LIMIT FOR USING BACTERIOPHAGES

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—Various laboratories in Calcutta are nowadays manufacturing bacteriophages for use in bowel diseases especially. Some foreign made are also available. The time limit for their use is very puzzling. Majority put two years as their time limit for use whereas two do not put any date at all, with the idea that their products can be used with benefit, after any length of time. Considering the mean average temperature of India, and also the manner in which they are stocked (they are not stocked in refrigerators), I think in some cases the bacteriophages are liable to deteriorate and lose their potency, before the time limit of two years. An independent test done by me entirely corroborates the report, published by Major Pasricha and others on this subject, that some preparations lose their potency before the time limit (*I. M. G.,* November 1937). I think, to the interest of the medical profession, the dates should be put in such a way as to maintain the maximum potency up to that time, and, moreover, it is wholly unscientific to declare that bacteriophages remain active and potent for years together, whatever may be the condition in which they are kept. Colonel Morrison was of opinion that 12 months should be the maximum length of time up to which the phages remain potent, if kept in cold storage. I shall be highly obliged if research workers on this line can throw light as to what should be the maximum time limit for use of bacteriophages in India; also whether it is scientific at all to believe that bacteriophages may be used after any length of time.

Yours, etc.,

A. N. SEN, M.B.,

Bacteriophage Worker,
The Lister Antiseptic and Dressings Company (1928), Limited.

P. O. COSSIPORE,
CALCUTTA,
2nd July, 1938.

Notes

MAINTENANCE OF HEALTH

HOW TO PREVENT MOST ILLNESSES IN CHILDREN

ALTHOUGH scientific research has given the world effective cures for almost every illness the old proverb, 'Prevention is better than cure', is still as weighty as it ever was—especially in regard to children's ailments. For it is in the immature stages of the growth of the human body that the foundation of future health and success is laid.

It is a medical fact that a great percentage of children's illnesses is due to constipation and could be prevented by ensuring complete and regular bowel movement. When their bowels are acting properly, clearing the system of all poisonous waste, children are at their best in health and spirits.

It is also a fact, however, that this happy state of affairs cannot be achieved by harsh purgatives. They act once or twice and then leave the bowels more bound than ever. What is indeed a gentle liquid laxative—California Syrup of Figs, for example—which sets up a natural movement and results in a thorough internal cleansing, doses being diminished when the bowels begin to act properly. Such a laxative is perfectly safe, for it is composed solely of carefully selected vegetable extracts with ripe fruit juice.

'ULERON'

HAVERO TRADING COMPANY, LIMITED, the sole representatives of 'Bayer' Laboratories at Elberfeld, Germany, beg to announce to the profession that Disepta! some time ago referred to in British medical papers is now introduced in India under the trade name 'Uleron'. It is the first successful chemotherapeutic against gonococcal infections. Up to date clinical results show that its curative action is best seen in sub-acute and chronic gonorrhœa and its complications, *i.e.,* when the patient has developed a certain amount of specific resistance. A course of treatment lasts for 3 to 4 days only and has been found sufficient in a large percentage of cases. Only in resistant cases is a second course of treatment necessary after an interval of at least 6 to 8 days. Relapses are comparatively very few. Such a short course of treatment with a very high percentage of successful results in a disease which has so far baffled all kinds of treatment is a unique achievement indeed.

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Original Articles

A STUDY OF THE ANTI-TUBERCULOSIS ACTIVITIES IN THE WEST, WITH SOME SUGGESTIONS FOR THE CAMPAIGN AGAINST TUBERCULOSIS IN INDIA

By C. FRIMODT-MÖLLER, C.B.E. (Hon.), M.B., Ch.B. (Copenhagen)

Medical Superintendent, Union Mission Tuberculosis Sanatorium, Arogyavaram, near Madanapalle, South India

IN thinking about the campaign against tuberculosis in India, one is almost paralysed by the immensity of the task that lies ahead, by the ignorance of so many factors concerning the disease, the number of problems which have to be solved, and the lack of resources for carrying out the work. So overwhelming is the task that one is nearly tempted to let things take their own course, and do nothing, except to treat the individual patients seeking help. Yet, if the doctors, who are to a large extent the guardians of the health of the nation, do not take a lead in such a campaign, it will be a vain effort, and the situation will be the worse for its failure, even apart from the disease increasing.

Few doctors in India have had the opportunity to study and see in person the anti-tuberculosis activities in the west, and a review of these is, therefore, now called for, as it would be very unwise to start a campaign, leaving out of account the experiences gained in the west during the last fifty years.

I. THE VARIOUS ANTI-TUBERCULOSIS ACTIVITIES IN THE WEST AND THEIR CORRELATION

It is of great interest that the anti-tuberculosis activities were begun differently in different countries in the west, while the measures now in force form a more or less uniform scheme in all of them.

In several countries in Europe, the activities began by establishing sanatoria, as in Germany, Denmark, Norway, Sweden and Finland. In France, the emphasis was laid on the establishment of tuberculosis clinics. In England, the modern activities began also by establishment of sanatoria, in addition to a considerable number of special hospitals for tuberculous patients, some existing from a time as far back as 1791, but mostly established in the middle of the nineteenth century. In Scotland, the activities began with the establishment of tuberculosis clinics and open-air hospitals and sanatoria.

(a) *The emphasis on tuberculosis clinics*

In no country in the west was the campaign against tuberculosis begun with such an emphasis on tuberculosis clinics as in France. The first anti-tuberculosis measure which was deliberately introduced in that country was the tuberculosis clinic advocated in 1896 by Calmette (Hazemann, 1936). Six years later he opened the first tuberculosis clinic in Lille where he worked, and he strongly advocated the establishment of similar clinics in each important centre in France. The object of these clinics was to carry out anti-tuberculosis education, to give advice concerning prophylaxis and hygiene, to see disinfection carried out in houses rendered unhealthy by patients, and to arrange free consultation and distribution of medicines for patients without means. The establishment of these clinics took place at such a speed that by the end of 1905 there were no less than 62 in France, of which about half the number were in or near Paris (Kayne, 1937). The facilities for institutional treatment, however, were up to 1914 only ten publicly supported sanatoria with a total of 862 beds. Then came the war, and the enormous number of soldiers invalided with tuberculosis aroused France. An act was passed in 1916 establishing clinics all over the country, and in 1919 another act was passed establishing sanatoria and the maintenance of patients in them. The result of these efforts was that in 1934 France, with a population of 42 millions, had 821 clinics, 156 sanatoria, 19 hospital sanatoria, 54 seaside sanatoria and 214 preventoria, with a total number of 71,632 beds set aside for treatment of tuberculous patients (Hazemann, 1936). This number is far greater than the corresponding figures for England and Wales, although France has only about 5 million more people than England. In England and Wales, in 1934, there were 478 clinics and 587 residential institutions with 28,900 beds. The tuberculosis death-rate in France in 1934 was 151 per 100,000 population, and in England and Wales only 76. The tuberculosis mortality for the age period of 20 to 39 years was in 1927 in France, double that of England and Wales (Hazemann, 1936).

In 1935, eight Departments in France, including Paris, the Lower Seine and the whole of Brittany, had a tuberculosis death-rate of over 200 per 100,000, a figure not seen in Great Britain in the last 30 years (*B.M.J.*, 1936). Although during the last decade France has had less unemployment and better economic conditions than other countries, yet the tuberculosis death-rate in Paris in 1930 was more than double that in London and more than three times that in New York. Paris still continues to have more deaths from tuberculosis than any other of the great cities in Europe (*B.M.J.*, 1932). May this state of affairs in France not be due to some extent to the emphasis in the beginning of the campaign on clinics as an isolated measure, without correlating them with facilities for institutional treatment? Rather late in the campaign, they are now certainly trying to remedy this.

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(b) The emphasis on institutional treatment

It would probably be a serious exaggeration to attribute to certain anti-tuberculosis measures the whole decline of tuberculosis in a country, but it cannot be overlooked or minimized that in those countries in the west where from the very beginning of the campaign the emphasis was laid on the importance of facilities for institutional treatment of the disease, the tuberculosis death-rate has declined most.

Long before any other country had dreamt of anti-tuberculosis activities, England had already introduced a considerable amount of institutional facilities for treatment of poor tuberculous patients.

The decline in the death-rate from tuberculosis in England began about 1840 and has since steadily been going on, but it is more marked after the period 1860–70. In Ireland, from about 1865, there was a steady increase in the death-rate from tuberculosis which continued until after 1900. This difference in regard to the tuberculosis death-rate during the same period has been explained by Newsholme (Faber, 1926) by the fact that from 1860–70 the pauper consumptives in England were advised treatment in special hospitals, while in Ireland they were treated in their own homes by public support.

It is doubtful whether this explanation of Newsholme covers the whole cause of the decline in England and the simultaneous increase of the tuberculosis death-rate in Ireland. But an interesting calculation concerning the fall of the death-rate has been made by Crocket (1934) who draws attention to the fact that the countries with tuberculosis death-rate ranging from 46 to 90 per 100,000 of population have an average of 0.97 beds per death—beds provided for the treatment of the disease—those with medium death-rates ranging from 91 to 133 have an average of 0.40 beds per death, while those countries with death-rates ranging from 161 to 199 have an average of 0.20 beds per death. Of the countries in Europe in 1932, the extremes were Denmark with a death-rate of 72 per 100,000 and 107 beds per 100,000 population, and 1.50 bed per death, and Portugal with a death-rate of 199, and 35 beds per 100,000, and 0.18 beds per death.

(c) The emphasis on a co-ordinated scheme

In Scotland, from the very beginning of the campaign, the emphasis was laid on the clinic and open-air hospitals and sanatoria. In Edinburgh, Sir Robert Philip established in 1887 the first tuberculosis dispensary in the world, and worked out the so-called 'Edinburgh system' of combating tuberculosis. It is very significant that from the first days of the campaign Sir Robert emphasized that the clinic was to be considered only as a link in a chain of measures of which institutional treatment was a very important part. The Victoria hospital for consumptives in Edinburgh was at the very beginning established as a part of the scheme. In 1906, Sir Robert Philip expressed 'The Dispensary Ideal' as follows: 'The tuberculosis dispensary should be, for every city or district, the uniting point of all agencies. It should not be an isolated institution, but form an integral part, indeed *the centre of a great network of operations*' (Philip, 1937) (the italics are Sir Robert's). Later, in 1908, he stated that 'the dispensary cannot afford to be an isolated institution. Its strength and success will depend, first, on the thoroughness of its internal organization, and, secondly, on the closeness of its relationship with other institutions concerned in the prevention and treatment of tuberculosis (Philip, 1937).

The result of this has been a correlated, well-planned campaign with which practically all countries in the west have now fallen into line. While in France in 1913 there were only very few facilities for institutional treatment in connection with the tuberculosis clinics, there were in Scotland at that time, per 100,000 of the population, not less than 44 beds available, which in 1932 had been increased to 104 (in France, to 67). In 1932, Scotland was second highest of all countries in Europe in tuberculosis beds per 100,000 population, and also second highest in beds per annual tuberculosis deaths. Denmark was leading, while England and Wales were behind Scotland in both respects by a large margin (Kayne, 1937). The mortality from tuberculosis in Scotland in 1875, shortly before the campaign began, was 361 per 100,000, while in 1936 it had fallen to 74. During the thirty-five years previous to 1933, the mortality from tuberculosis had, in England and Wales, been reduced by 56 per cent, and in Scotland by 64 per cent (Philip, 1937).

While the campaign in Germany and the Scandinavian countries began with the sanatorium movement, they have since seen the absolute necessity of combining this measure with the clinic system and other measures later adopted. Some of the most efficient clinics are now found in Germany, Norway and Denmark.

(d) Colonies for ex-patients and village settlements

It did not take many years after the introduction of the anti-tuberculosis activities mentioned, before it was found necessary to add to them other measures. Already, in 1904, Sir Robert Philip began to advocate the establishment of tuberculosis colonies, specially for patients leaving sanatoria, but not yet able to return to ordinary occupations, without fear of relapse of the disease.

The pioneer institution in England in this line is the Papworth Village Settlement established in 1916 by Sir Pendrill Varrier-Jones.

Few movements have been more misunderstood than 'village settlements' and 'ex-patients' colonies'. Many would think of them

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as colonies in village style, where some poor patients can settle down and earn their living by gardening or other light outdoor occupations. Papworth is, however, quite a different thing. In considering the nature of service rendered at Papworth and the needs which require to be fulfilled, Sir Pendrill writes (Papworth: Annual Report, 1936): 'First and foremost, there is prolonged medical and surgical treatment. . . . Prolonged treatment—so different from the sanatorium treatment of 25 years ago—may include surgical interference'. Another description which reveals the thorough treatment at Papworth is given by Brieger (1937) who writes: 'The medical services of the village settlement are developed from the hospitals; and it may be divided for purposes of description into the following units: ante-natal, ophthalmic, dental, ear nose and throat, orthopædic, collapse therapy, two radiological units, the psychology unit, and industrial physiology (research) unit. The research units are developed into the following departments: bacteriological and pathological and biochemical'.

Papworth is a complete institution beginning with a hospital section of 180 beds fully equipped with operating theatres, laboratory and research departments, going on to a sanatorium section with 137 beds, then a hostel section with 155 beds, and ending with a village section of 120 cottages and factories equipped with modern machinery run on competitive business lines. Only carefully selected ex-patients from their own or other institutions, who have had full experience of institutional treatment, are admitted to the village to continue to live there, because only such ex-patients have learnt, by the regime of sanatorium treatment, the limitations of their physical health and discipline of mind and will necessary to live, work and thrive in a colony.

(e) *Care and after-care organizations*

In the modern anti-tuberculosis activities, in some countries in the west, there have not only been established colonies for ex-patients, but there have also been added other organizations for the after-care of tuberculous patients, and even organizations for the care of dependent relatives, before and during the institutional treatment of the patients. In recent years there has rightly been a general tendency to lay special emphasis on the care and after-care as one of the most important of the anti-tuberculosis activities in connection with the clinics.

The main objects of the care and after-care organization are: (1) helping patients to take advantage of institutional treatment by enabling a sick bread-winner to secure food or clothing for his family from charitable or public bodies during his absence for treatment; (2) assisting patients, when they cease to have institutional treatment, to find suitable work and occupation which will not produce relapse of the disease; (3) assisting in the prevention of the spread of the disease both within the home and from the home, as, for instance, by removing young children from the infected home or by arranging for a separate sleeping place for the patient, and by improving the sanitary conditions of the home.

(f) *Tuberculosis surveys*

One of the most important developments in the campaign against tuberculosis in the west is the modern extensive surveys carried out by various skin tests for tuberculosis and by *x*-ray examinations. In addition to dealing with patients and contacts of patients, the modern clinic has developed a wider field of work and is examining whole groups of people and communities, such as students in colleges and schools, special professions and occupations, and age groups, in order to weed out from among them the non-clinical yet frequently infectious persons, and to detect those who ultimately would break down and only seek medical help when the disease was fairly advanced. The following is an example of the type of work. Among 1,180 medical students in Copenhagen, who were positive reactors to the skin test, 19 were found to be suffering from various forms of tuberculosis, and 12 of these from pulmonary tuberculosis, all of them feeling absolutely fit and healthy. In 5 of the 12 with lung disease, tubercle bacilli were found in the sputum, and in 2 more in the water from a stomach lavage (Holm and Helweg-Larsen, 1938). Through such surveys the spread of the disease has been found to be very different in different communities and occupations, and in different areas and age groups. The whole epidemiology of the disease is now far better understood, and the spread of the disease has been studied in relation to many of the factors which might influence this spread. These surveys have widened the activities and usefulness of the tuberculosis clinic and have given it a new significance and brought it still further to occupy a foremost position in preventive work against tuberculosis.

(g) *Research work bearing on the campaign*

In connection with the campaign against tuberculosis in the west, there has been and still is, in increasing measure, a great deal of research work going on about factors influencing the spread of the disease. It is impossible here to go into much detail about this research work, but some of the important lines may be mentioned.

(i) *Acquired immunity.*—One of the problems is to what extent is acquired or induced immunity a factor to be considered in practice with regard to prevention of the disease. Skin tests among nurses and medical students in many places have shown that without doubt a positive skin test can be interpreted as a sign of effective immunity against later exogenous infection with tuberculosis (Heimbeck, 1938). The result

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is that, in several countries in Europe, probationary nurses and medical students who react negatively to tuberculin are being prohibited from working in the wards for tuberculous patients only, unless they have been first vaccinated with B. C. G. vaccine.

On the other hand, in South Africa it has been found that among the negroes coming for work to the mines in the Rand, those who react positively to tuberculin develop tuberculous disease much more than the negative reactors (Wilcocks, 1935). So, a positive reaction among these negroes is certainly not a sign of effective immunity. Cummins (1935) explains this by saying that the negroes are in a child-like stage, living a very primitive life, without contact with tuberculous infection. They are, therefore, so susceptible to the tubercle bacillus, that—to use his own words—'the mere fact of latent infection, as revealed by tuberculin tests, has for African adults the same rather sinister significance as it has for infants and young children in this country (*i.e.*, England), and sounds a note of warning that any undue stress or intercurrent illness may determine generalization of the disease'.

This experience shows it is not always possible to transfer conclusions arrived at in Europe to other parts of the world and build on them without finding whether they hold good for those parts.

(*ii*) *Virgin soil.*—The conception of 'virgin soil' which was so prominent a few years ago is being considerably modified, as research, again among the African, has shown that when tuberculosis is introduced among negroes living in their natural surroundings, it does not appear as a rapid epidemic, but has a slow propagation, as in a village in England (Cummins, 1929). But when tuberculosis is introduced among negroes living out of their natural environment and under conditions of stress or strain, it appears rather like an epidemic disease with enormous mortality, as seen, for instance, among the non-European South African troops serving in France during the war, where the incidence of tuberculosis was fifteen times greater than among the British troops serving in the same area, and with a death-rate of 56.0 per cent of the former sick against 5.7 per cent of British troops. This has its bearing on the spread of tuberculosis in towns whose population is largely drawn from people coming temporarily from the villages to live under completely new and trying surroundings.

(*iii*) *Race susceptibility.*—As regards the relationship between race and susceptibility to tuberculosis, recent investigation points to a lower natural resistance in coloured races to the disease, as judged by the different and more dangerous type of tuberculosis found in them, as compared with what is found in the western races.

(*iv*) *Inheritance.*—The question of direct inheritance of tuberculosis has been found to be of no consequence with regard to the spread of the disease. Hereditary disposition to the disease in a family is still under discussion. It has been found to be direct infection of the children after birth from parents with open tuberculosis, which has given rise to the theory of inheritance. Removal of children from such homes has, specially in France, become one of the great measures in the prevention of tuberculosis, as well as vaccination with B. C. G. vaccine of such children; over one million children have been vaccinated in France.

(*v*) *House infection.*—As regards the question of house infection, it has now been proved that it is not the house which is infectious, but the infection comes only from the tuberculous person living in the house. As soon as he is removed, the house ceases to be dangerous.

(*vi*) *Climate.*—The question of the influence of climatic conditions on the incidence of tuberculosis and on the tuberculous person is complicated.

It has been frequently demonstrated that excessive heat and exposure to rain-bearing winds are detrimental. It is not humidity nor elevation in themselves which have great influence. Many of the sanatoria in Great Britain and Denmark and elsewhere are situated on the sea-coast and have as good results as those situated inland or in the high mountains in Switzerland.

Good climatic conditions are no protection against the spread of tuberculosis, as, for example, in many of the sunny southern European towns, such as Athens, Seville and Lisbon, the tuberculosis mortality is even five to ten times greater than in towns situated in less favourable climatic conditions in the northern countries (Morland, 1936).

(*vii*) *Poverty and malnutrition.*—The question of the influence of poverty on the development of tuberculosis is not so simple a question as one would naturally believe, and its influence has undoubtedly been much exaggerated. If poverty were one of the chief factors in causing an increase in the tuberculosis mortality-rate, why is it that this mortality-rate never declined so much and so rapidly in Germany as during the years after the Great War when there was an unprecedented period of poverty and unemployment (Frölich and Overland, 1932). In 1932, Germany had 15 million of its 64½ million people living on the dole or other forms of public relief, and even this was severely cut in that year. Yet the death-rate from tuberculosis, which was considerably higher than in England before the war, drew level with it in 1926 and in 1928 actually crossed it, the figure for England and Wales being 91, and for Germany 88 (Royal Institute of Public Health, 1933).

In spite of the prolonged economic depression, the death-rate from tuberculosis in New York during 1931 was the lowest recorded there up to that time (Wynne, 1932). An investigation in Norway draws attention to the fact that the

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spread of tuberculosis in the area surveyed seemed not to have any relationship to economic, sanitary and dwelling conditions (Lunde, 1933).

It has often been pointed out how the mortality-rate from tuberculosis increased in all countries engaged in the Great War during the time food shortage was very marked. It is, however, a question whether the shortage that had the effect on the tuberculosis mortality-rate was not rather a shortage of the right kind of food, than a shortage of quantity of food.

It cannot be doubted that malnutrition is of great importance in relation to the development of tuberculosis. A very striking proof of this is supplied by an investigation among soldiers in Norway (Overland, 1937). In Trondheim, the soldiers who were called up for long service lived in small lodgings in the town, and a high incidence of tuberculous disease was found among them. To remedy this, a modern barracks was built in 1911. To the greatest surprise it was found that the incidence of the disease among the soldiers now living under the best hygienic conditions, increased, instead of decreased. In 1925 the diet was changed, according to the modern experiences of nutrition, and in the four-year period from 1925 to 1928, the incidence of tuberculosis fell from 6 per cent to about a ½ per cent.

That tuberculosis is more prevalent in the slums than in other places is no proof that poverty as such, and not malnutrition, under these circumstances, is the most important factor. A recent investigation in England in a crowded area has shown a relationship between tuberculosis and undernourishment, as judged by deficient dietary (Hart, 1937).

If the increase in tuberculosis is due more to malnutrition than to poverty, it might be possible that a campaign for the right choice of food without increase, or only a little increase in the cost, would have a far greater effect on the decline of tuberculosis than a raising of the general standard of living and an improvement in the hygienic conditions which are tasks far more difficult to tackle.

II. SUGGESTIONS FOR THE CAMPAIGN IN INDIA

(a) *The present position in India*

Turning to India, the prevalence of tuberculosis is something about which we can say nothing definite. Megaw (Jolly, 1936) says that there are probably over 2,000,000 cases of tuberculosis in India, while Ukil (1938) estimates that there are about 1,000,000 in Bengal alone. Lankester (1920) stated that there were more than 10,000 cases of active tuberculosis in Bombay city, and there are good reasons to believe other cities are equally infected.

Sir Leonard Rogers (1925) writes that post-mortem examinations in the Medical College Hospitals, Calcutta, show a higher mortality in Calcutta from tuberculosis than from any of the so-called tropical diseases. One thing is certain, however, and that is, that tuberculosis is exceedingly widespread in India, and, moreover, is increasing and spreading, specially with improved communications, to previously comparatively isolated areas.

In spite of the paucity of our knowledge about the prevalence of tuberculosis in India, our knowledge is more than sufficient to make us see the absolute necessity of seriously tackling what is a menace to the whole country, a danger from which no class or community, high-born or low-born, rich or poor, is protected. To meet the attack of this enemy, it is necessary to pool the resources of the whole country, the means at the disposal of the Government, and the means at the disposal of private societies and individuals. The situation is so serious that only the united efforts of all can hope to be able to make any headway against the disease.

(b) *The existing anti-tuberculosis activities in India*

In the past there has been but little organized effort to deal with the tuberculosis problem as a whole; the anti-tuberculosis activities that there have been, have been mostly isolated efforts, either Government or private, which have resulted in the treatment of a comparatively few sick individuals. The facilities for institutional treatment, when we consider the size and population in India, are practically nothing, there being only about 2,000 beds for tuberculous patients in about twenty sanatoria and in various hospitals, for the whole of the Indian Empire. If the people of India should have the same opportunity for institutional treatment of tuberculous patients, as, for example, the people in Scotland, there should be not 2,000 beds, but 390,000, that is, one bed for every 900 of the population.

In addition to the sanatoria and hospitals mentioned above, there have been in some of the main cities tuberculosis clinics, but their work has been terribly handicapped by there being no place to which they could send patients found to be in urgent need of institutional treatment. Nevertheless, the need for and the usefulness of clinics in India has been amply demonstrated.

Such institutions as there are in India for the treatment of tuberculosis have not materially influenced the situation as regards tuberculosis in general nor could they be expected to do so. But apart from their treatment of individual patients, they have abundantly justified their existence by showing what can be done in the treatment of tuberculosis. In those institutions where the modern treatment of tuberculosis is carried out in all its aspects, this treatment, both immediate and in its after-results, has been found to be equal to that in the west.

(c) *The situation in India in the light of the campaign in the west*

In India, we now stand where tuberculosis workers stood in England and other western

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countries thirty to fifty years ago, and we cannot expect in a year or two to be in the position that those countries are in now, after nearly half a century of careful thinking, painstaking research, much hard toil and enormous expenditure of money. But, we do have the advantage that we can begin our campaign in India with the experience of all that has been found most useful in the west before us, and we need not make the same mistakes as have been made in the west in the earlier phases of the campaign.

From what has been said in the earlier part of this paper, it will have been seen that, although different countries began their campaign with emphasis on different measures, all have tended to adopt a more or less uniform scheme, combining all the various measures duly co-ordinated. Although this is so, a wholesale transference of all the links of the western co-ordinated scheme for the whole of India is, of course, at present totally out of the question. The general poverty of the country, the shortage of specially trained tuberculosis doctors and other tuberculosis workers, the absence of health insurance schemes and other social schemes for helping the sick, the absence of voluntary or compulsory notification of tuberculosis, all stand in the way.

Moreover, no scheme, however perfect, will work, if imposed without the good-will and co-operation of a people who will be willing, even at sacrifice to themselves, to bear the burden of such a scheme. Such good-will and co-operation can only follow a thorough education of the public from childhood upwards in the dangers, problems and measures associated with the disease which is such a menace to all.

On the other hand, even if we could introduce all the links of any western scheme into India, it is not at all certain that it would be right to do so. It might be wiser, for instance, to emphasize a particular part of the scheme at the beginning of the campaign and at the same time have in mind the necessity for changing the emphasis later, as the campaign advanced, than to try to introduce all parts of the scheme at the same time and weaken the whole campaign by overstraining it.

(*d*) *The tuberculosis clinic in India*

In the present conditions in the west, as already described in the paragraphs dealing with the emphasis on tuberculosis clinics, care and after-care organizations, and tuberculosis surveys in Europe, the tuberculosis clinic has come to occupy a very important place as the connecting link in the various measures of the whole campaign. In order to be better able to understand the position of the tuberculosis clinic in India, it may be worth while to amplify a little some of the various activities of the modern tuberculosis clinic in the west. It is not only a clearing house for detecting and passing on patients to treatment institutions, but, by its work among family and other contacts in close co-operation with the private practitioners, it is more and more coming not only to detect the disease in those who have already detected it in themselves and have sought help at the clinic, but also to detect the disease in what is called the pre-clinical stage. Further, by its survey work, it is finding out some of the more dangerous sources of infection, namely, apparently healthy persons, themselves unaware of their sickness and living a normal life and doing their work, and yet spreading infection widely, because they have open tuberculosis. In order to carry out such activities, the modern clinic is equipped with all facilities for diagnosis, such as *x*-ray facilities, a laboratory enabling it to carry out all the cultural and other methods now used for detecting tubercle bacilli, and blood and other examinations also used in diagnosis. Such a clinic has become indispensable to the general practitioner who has usually not the time, the facilities, nor the specialized experience to come to a definite diagnosis in many of his doubtful cases. In earlier years the clinic gave little treatment, but the tendency is now to give certain treatments, such as pneumothorax treatment, chiefly because this is a particularly preventive measure, making many patients sputum- and bacilli-free or keeping them free over long periods. In some clinics gold and light treatments are also given.

From what has been described of the work and activities of a modern clinic as found in large centres, it will be understood that such a clinic needs a full-time and specially trained technical staff, including one or more tuberculosis specialists, a nurse, *x*-ray and laboratory technicians, clerks and tuberculosis health visitors; in addition, there has to be organized in connection with the clinic an influential care and after-care committee with whom the medical officer in charge of the clinic and the health visitors should work in close connection.

In a campaign in India, the tuberculosis clinic must occupy the forefront in the campaign, as it has come to do in the west. But experience from the west has taught us that the clinic will be a failure if it is worked as a completely isolated unit. When Tattersall, chief clinical tuberculosis officer of Leeds, England, writes about the modern clinic in England (Tattersall, 1936): 'Dispensary organization cannot be discussed as a separate entity; it is only one part of the complete tuberculosis scheme, and apart from its indispensable complement—institution beds—would be a feeble weapon' his remark is as true of the clinic in India as it is of the clinic in England.

In India it is at present out of the question to start to provide immediately a great number of beds for patients detected by the clinics. But a right beginning can be made by establishing clinics in connection with existing institutions, such as headquarters hospitals where the special tuberculosis officer in charge of the clinic should

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have a certain number of beds at his disposal. In a few of the clinics already in existence in India, this has been done. The purpose of these beds should not be for accommodating a few chronic and possibly hopeless cases, but should be used for beginning pneumothorax treatment or for patients needing special observation for establishing a final diagnosis. Patients in whom pneumothorax has been induced, will have to come to the clinic, if possible, for subsequent refills, unless there are specially trained private practitioners who are willing and able to give them.

When sufficient properly trained staff becomes available, it will be possible to establish smaller clinics, such as in *taluk* headquarters and elsewhere, but such smaller clinics should be under the direct control and supervision of the central clinic, and be able to use all the facilities of the central clinic, when necessary.

The great danger in India is that in the eagerness to do something against tuberculosis, a large number of clinics may be established which will be completely unable, through lack of personnel and equipment, to do the work a clinic ought to do, if it is to take any effective part in the campaign. In the present state in India, the watchword of the campaign should be concentration of effort and not diffusion. A little done properly will ultimately be of far greater importance for the tuberculosis campaign than efforts which might touch a greater number of people but which would be, by the very fact of their being so widespread, really inefficient and practically useless, a waste of money and energy, discrediting the campaign itself.

(*e*) *Establishing of tuberculosis hospitals and sanatoria in India*

In every place where a central clinic has been established, it follows, if the full value of the clinic is to be obtained, that some kind of provision, apart from the few beds already mentioned, should be made for the treatment and isolation of patients. It might be that for the sake of economy a section for tuberculosis could be added to an already existing hospital, with a tuberculosis specialist in charge. It would be better, however, wherever possible, to provide small separate hospitals for tuberculous patients outside but not far away from the larger towns. The climate in most places in India and the customs of the people make it possible for such small hospitals to be of very simple and open construction and comparatively inexpensive. These hospitals should be built in places with room for expansion, if later found necessary, and also with sufficient space to prevent the hospital being hemmed in too closely by unsuitable buildings, if the town expands, and to provide the necessary room for the first stages of graded exercise of the patients.

While these small hospitals outside the larger towns will meet a part of the immediate need for places for treatment, the whole campaign would suffer, if there were not at least one sanatorium with more than 100 beds and all modern facilities for treatment and research, and training of doctors in tuberculosis, in each province. Ultimately, there ought to be one sanatorium for each district of two or three million people, but in the beginning several districts might combine in the running of one sanatorium. Like the special hospitals mentioned above, these sanatoria too need be only of very simple construction, which the Indian climate renders possible. The value of a sanatorium does not lie in the grandeur of its buildings, but in the treatment carried out, and it is much more reasonable to put the money into the medical outfit and equipment, than into buildings of grand architectural style. The medical equipment should, however, be of the very best, because the treatment of tuberculosis has advanced far beyond the open-air rest cure of the early sanatoria in the west. A modern sanatorium admits cases which the early sanatorium would never have dreamt of admitting, because now it is often possible to do something for such patients and to do it best in a sanatorium. But such modern treatment demands the highest medical and surgical knowledge and equipment with *x*-rays and laboratories to be used not only for diagnosis, but also for the control of the treatment. In the west it was in the sanatoria that the whole modern conception of tuberculosis and its treatment was worked out, and in India, too, it is in such sanatoria that the treatment best suited to the type of tuberculosis in India and to Indian patients, will have to be worked out.

The latest stage in the campaign will be the establishing of ex-patients' colonies and after-care centres, run in connection with already existing tuberculosis sanatoria. These colonies, too, should be in simple style with a village type of house adapted to the needs of ex-patients, and the industries should be on as simple lines as possible.

(*f*) *The training of tuberculosis doctors*

While clinics, hospitals, sanatoria and ex-patients' colonies will probably in the end form part of the campaign against tuberculosis in India, all these institutions will be useless without properly trained tuberculosis doctors to run them. Therefore, the first and most important step in the campaign is to train such doctors.

There must be a centre in each of the larger provinces for the special training of doctors in tuberculosis. Such training is necessary for all doctors who are going to specialize in the treatment of tuberculosis, but it is above all necessary for the doctors who are going to work in the clinics. These doctors cannot be trained in the clinics themselves, but must have a complete all-round training in tuberculosis in a central well-equipped institution of some considerable size, where they can become thoroughly conversant with modern methods of diagnosis and treatment. The tuberculosis officer in charge of

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a clinic, by the very nature of his front position in the campaign, must be one with a thorough knowledge of all the links in the campaign or else his work will tend to become isolated, and the more it is isolated, not only will the work of the clinic itself be less effective, but it will also become a stumbling-block in the whole campaign. If we have learnt anything from Europe, it is that the campaign must be correlated and co-ordinated in all its links.

It must be understood that a clinic will never develop to what it should be if the doctor in charge is one who has only one month's theoretical training with a few demonstrations of patients and methods of treatment. This is a totally inadequate preparation for doctors who shall lead the tuberculosis campaign. These short courses of a month's duration are, of course, valuable to general practitioners to give them a glimpse into what is being done and can be done in the modern treatment of tuberculosis. These courses are, therefore, of some value to the whole campaign.

(g) Necessity for tuberculosis research in India

While the efforts hitherto described are being developed for the general population, there ought to be selected special areas or groups of people for intensive research with a view to working out experimentally the best way in India to tackle the whole tuberculosis problem. This could well be done in, for example, one or more of the large industrial concerns such as has been done in the Michelin works near Paris *The Lancet*, 1937). About thirty years ago this industry with 22,000 people dependent on it, began to do away with all the slum houses of its workers and then began first a tuberculosis dispensary and afterwords a sanatorium and its own care and after-care organization. In 1922, as many as 13 per cent of the attendants at the dispensary were advanced cases, in 1935 only 1.5 per cent; in 1931 there were 181 new cases of tuberculosis, in 1936 only 84, a fall from 8.2 to 3.8 per 1,000 inhabitants.

In addition to research among a particular group of people like those employed in one industrial concern, certain areas should also be chosen for survey and research into social and epidemiological problems of tuberculosis in a general mixed population, with all the anti-tuberculosis measures in full force. These problems can only be solved by working in such concentrated areas and not by working loosely over the whole of India. It is such surveys and intensive work in Europe and elsewhere which have brought to light most of our present knowledge of tuberculosis problems. India has its own problems which need their own investigation and solution, such as the type of tuberculosis in India and its particular treatment, the rôle of acquired immunity and natural resistance to the disease, the significance of a positive skin test, as well as the question of malnutrition and its part in the development of the disease.

(h) Propaganda in the campaign in India

One of the watchwords in the campaign in Europe has been education of the public with regard to tuberculosis, and the same is even more necessary in India.

There are two kinds of propaganda which should be kept separate and which should not be done at the same time. The first is propaganda where the sick are found to be and concerns the education of them and their contacts with regard to the nature of the disease and its spread among them. Such propaganda should, of course, stress the seriousness of the disease, but it should not be overdone so as to frighten people. A poster such as 'Do not go near a tuberculous patient' as has been seen in India, does great harm and creates unnecessary suffering, specially as the idea behind it is quite wrong; tuberculosis is an infectious disease, but is certainly not a contagious disease. In Cyprus (Bardswell, 1938) propaganda of this type led to such a panic that tuberculous patients were liable to be turned out of a village and left to die by the wayside for fear of the infections they might cause. Further, misguided propaganda is sometimes seen in the giving of short lectures on tuberculosis in various villages, without knowing beforehand whether there are any tuberculous people in these villages at all. This costs money which could be more profitably used in propaganda where patients are. Such wider propaganda should be done only after a careful tuberculin survey of the area.

The second kind of propaganda is just as important for the whole combating of the disease, but is of a totally different type. This is the education of the general public through schools and colleges, reading-rooms, and through the press and radio, about the necessity of a campaign against tuberculosis. This type of propaganda should be designed to reach all classes of people. One of the main things to be stressed is that it is wrong to say we cannot do anything until social and economic conditions of people improve. There is an idea current, as stated earlier, that tuberculosis mainly affects the poor classes. If such opinion is allowed to go unchecked, it may in the end do great harm to the campaign, as it is likely to result in the failure to interest the well-to-do classes who should be made to realize that the tuberculosis problem is as acute for them as for the poor. The fact is that some of the most well-to-do families in India are riddled with tuberculosis. It would, therefore, be a very short-sighted policy for the rich people of India to do nothing in the hope that one day, when general living conditions have improved, it will be found that tuberculosis has faded away by itself. This is contrary to experience all over the world in modern times at least, where no decline has taken place without there having been a campaign with anti-tuberculosis activities directly attacking the disease.

It will be decades before we can hope to begin to see the results of all our labours. There may

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be much disappointment, and many discouraging results. In the earlier stages of the campaign it may even appear that the disease is rapidly increasing, in spite of all our efforts, because disease now hidden will come to light and the demand for treatment will be out of all proportion to the existing facilities. It is under just such a situation that well-led propaganda will be able to create the will to conquer at any cost. We have every expectation that India, like the countries in the west, can and will face this common enemy of all its people, and face it with success.

Everyone who can take any share in the fight against the enemy tuberculosis, whether he be rich or poor, will be a partaker and a welcome partaker in the campaign, for the way to success will be a long and uphill road.

Summary

(1) A review is made of the various anti-tuberculosis activities which have grown up in the west, chiefly during the last fifty years, and attention is drawn to the differing emphasis, in the beginning of the campaign in different countries, on ways of tackling the disease, and the relation between the various activities employed to the tuberculosis mortality in the various countries.

(2) Experience in the west has shown that these activities in isolation from each other have not had the influence on the decline that a correlated and co-ordinated scheme with the different activities closely linked has had; as a result nearly all countries have now come to employ a more or less uniform scheme.

(3) The new emphasis on the after-care of ex-patients through colonies, village settlements and after-care organizations is discussed.

(4) The widening of the work of the tuberculosis clinic in recent years to include the searching out of patients with pre-clinical disease by examination of contacts and by surveys of special occupations and groups is pointed out as giving the clinic an increased prominence in the prevention of tuberculosis.

(5) An outline is given of certain research work bearing on the campaign, such as the questions of acquired immunity, virgin soil, race susceptibility, inheritance, climate, poverty and malnutrition.

(6) The present situation in India is reviewed with regard to the prevalence of tuberculosis and the present anti-tuberculosis activities.

(7) The possibility or desirability of introducing all the links of the western campaign into India at the present time is discussed.

(8) The position which should be occupied by tuberculosis clinics in India is dealt with, as also their work, staff and equipment, with a warning against the isolation of their activities from other measures indispensable for bringing out the full value of the clinic.

(9) Suggestions are made for creating facilities for institutional treatment in connection with clinics.

(10) It is pointed out that the first step in the campaign is the proper training of tuberculosis doctors without whom the campaign cannot succeed.

(11) Suggestions for tuberculosis research work in India, essential for the campaign and the combating of the disease, are mentioned.

(12) The need for education of the public through the right types of propaganda is stressed, both with a view to reaching those among whom the sick are found, and with a view to securing the co-operation of the whole public of India, without whose co-operation and sacrifice no campaign to stamp out the plague of tuberculosis can succeed.

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THE CAMPAIGN AGAINST TUBERCULOSIS IN ITALY

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LONG before the discovery of the tubercle bacillus by Robert Koch in 1882, the infective nature of consumption was known and voluntary sporadic measures were adopted in different places in order to prevent the spread of infection.

Early developments

Thus in Italy, as early as 1621, the sanitary authorities at Padua forbade Jews from buying and selling without licence the blankets, beds, and other articles that had belonged to patients who had died of pulmonary tuberculosis, and early in the eighteenth century, the republic of Lucca gave orders that the houses and belongings of persons who had died of consumption should be disinfected.

The earliest institutions for the care of the tuberculous in Italy were isolation sheds attached to monasteries where patients were left to die in peace.

In 1782, two wards in the hospital for incurables at Naples were set apart for consumptives. In the same year, the earliest known anti-tuberculosis fund in Italy, namely, 100,000 'ducati', was raised in Siracusa for helping poor consumptives.

In 1853, a number of institutions for scrofulous children were started along the Adriatic coast. These were supported entirely by voluntary contributions. Soon after, alpine colonies for children predisposed to tuberculosis were also started.

Preventive campaign intensified after the discovery of the tubercle bacillus

Under the stimulus of the discovery of the tubercle bacillus in 1882, more active and general measures for the prevention of tuberculosis were adopted. Local governments prohibited tuberculous patients from living in crowded areas of towns. The regular inspection of milk supplies and slaughter-houses was ordered. Spitting in public places was prohibited by notices and posters. Periodic examinations of school children and teachers were demanded.

In the first decade of the twentieth century, the 'General Sanitary Regulations' of Italy were passed. Special wards and institutions for the tuberculous increased in numbers. The military authorities took active steps to prevent tuberculosis among the troops. For the first time the state set apart a sum of 200,000 lire for anti-tuberculosis work in 1914. The military authorities together with the Red Cross Society provided for 3,000 beds in all, for the tuberculous.

In Italy, as in other countries, the years of the Great War showed a great increase in the mortality rate of tuberculosis.

In 1919, a law was passed authorizing the formation of *consorzi* (anti-tuberculosis associations) in certain provinces for co-ordinating all the anti-tuberculosis activities in these provinces. The asylums or mere isolation centres were gradually abolished and treatment centres substituted in their places, proclaiming that tuberculosis was not only a preventable disease but also a curable one. The battle which Carlo Forlanini had been fighting during the preceding two decades for popularizing artificial pneumothorax as a therapeutic measure helped greatly in bringing about this new view of tuberculosis.

The Fascist regime

With the coming of the Fascists into power a new era opened in Italy. The new life infused into the nation found its reflection in the campaign against tuberculosis also.

A few leading phthisiologists and public health workers together formed a 'National Federation for the Campaign against Tuberculosis'. These men carried out a rough survey of tuberculosis mortality and morbidity in Italy and also of the means which were then available for combating the disease. As a result of their findings they declared that the fight against tuberculosis, to be effective, should be an organized national fight; that the state should take the initiative; and that, while voluntary organizations could be valuable auxiliary means, these can never be adequate to meet the needs of the great national problem.

In 1926, a delegation of the above-mentioned federation waited upon Signor Mussolini and impressed upon him the need for including anti-tuberculosis work in the Fascist programme of national reconstruction. A year later a comprehensive piece of anti-tuberculosis legislation was passed into law, whereby a special national insurance against tuberculosis was incorporated into the national '*Carta del lavoro*' (labour charter), and anti-tuberculosis associations (*consorzi*) were made compulsory in all provinces, and the governors of provinces were made responsible to see that these *consorzi* functioned efficiently.

The relation of the state and its public health department to the campaign against tuberculosis

The Fascist government recognizes the health of the nation as a direct responsibility of the state. Inaugurating the campaign against 'social diseases' in Italy, Signor Mussolini said: 'It is evident that a well-ordered state should consider the health of the nation as its first concern'*. The vigorous campaign against

* Discorso dell Ascensione, Roma, March 1927 (quoted in 'Lotta contro la tuberculosi', April 1935).

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tuberculosis which attracts the attention of even non-medical casual visitors to Italy is only a part of the drive which the Fascist government is carrying on against all 'social diseases'; and this drive in its turn forms a part of the general, all-round popular campaign for raising the level of national health by all possible means.

Speaking about the campaign against tuberculosis in particular, Signor Mussolini said: 'While you scientists and medical men confront this problem in your laboratories and clinics, we statesmen of the Fascist regime shall meet it with ever-widening means which shall be adequate to the end'*. 'In the law of insurance against tuberculosis, the Fascist government has provided you with an armament formidable in the fight. The unification of all your energies symbolized in the Roman sign of the Littorio is more necessary here than anywhere else†. Collecting all our energies, improving day by day the various methods of combating the disease, and bringing into the fight fervent enthusiasm and our spirit of decision, we are sure to win against tuberculosis'‡.

The Italian campaign is directed, controlled and supported by the state. The Minister of the Interior is at the head of the organization which forms an integral part of the national public health department. In Italy the curative and preventive aspects of medical work are less and less being kept in separate compartments, but they are gradually being made to form part of one complete scheme for the promotion of national health. In fact curative medicine is being more and more looked upon as an aspect of preventive medicine. Not only doctors in government employ but also private practitioners are made to fit into the scheme of preventive work.

The state supports the movement by suitable legislation and by grants from the government treasury. The legislation of 1927, referred to above, has formed the backbone of the campaign ever since. During the five years 1929 to 1933, the Minister of the Interior has advanced 214 million lire§, for anti-tuberculosis work in Italy.

The consorzi

These are the provincial anti-tuberculosis associations. Each province is compelled by laws to have its own *consorzio*. The prefect (governor) is usually the president of the association. The *consorzi* are specially concerned with the preventive aspect of tuberculosis, the dispensaries being directly under them. They co-ordinate all the anti-tuberculosis activities, both preventive and curative, in the province.

Each province is divided into communes and each commune has to pay to the provincial association a subscription in proportion to its population and wealth, the rate per head being one lira or less per month. On the *consorzi* are represented: The province and the communes (compulsorily), charitable organizations, approved trade unions, and provident and insurance organizations. Medicine is represented by the medical director of the *consorzio* who receives instructions from the centre, and the chief provincial doctor (surgeon-general) who collaborates directly with the governor. The *consorzi* work in co-operation with the sanatoria and other treatment centres which are financed by the national insurance.

National insurance against tuberculosis

The aim of the Fascist government is ultimately to insure the nation against all diseases. As a first step towards this ideal, the 'social diseases' are being brought under insurance. It is significant that among the social diseases pre-eminence has been given to tuberculosis. Italy is the only country where there is a special insurance against tuberculosis.

Roughly, the outline of the scheme is as follows: The insured person contributes one lira per month for a daily wage of 8 lire or less, and 2 lire per month for a daily wage of more than 8 lire. The employer pays the same amount. In return the insured, if he falls a victim to tuberculosis, gets free consultation and treatment in the institutions conducted by the insurance associations. Moreover, during the period of illness of a bread-winner, his family immediately dependent upon him gets a monthly allowance.

More than half the population of Italy has been insured. Not only labourers, but also agricultural workers, small-holders, share farmers, teachers in primary schools, etc., are gradually being brought under this scheme. Insurance against tuberculosis is compulsory for persons of both sexes, who are insured against invalidity and old age.

Out of 150 million lire expended in 1930 by insurance, 95 millions were devoted to the treatment of tuberculosis.

The following are the approximate figures:—

Treatment at home : 20 million lire.
Treatment at sanatoria : 70 million lire.
Out-patient treatment : 860,000 lire.
Allowances to families of patients placed in institutions : 5 million lire.
For construction : 60 million lire.

The national medical organization

The direction of the medical and scientific aspect of the campaign against tuberculosis in Italy is vested in the 'Italian National Federation against Tuberculosis'. This body is mostly constituted of doctors, especially phthisiologists, and is concerned with the study of the medical

* Message from 'IlCapo del Governo' to the second national congress against tuberculosis, Milan, 1927.
† Message from 'Il Duce' to the national congress against tuberculosis, Bolognia, 1931.
‡ Quoted by 'Giornata della due Crosi', April 1934.
§ One lira may roughly be taken as equal to 3½ annas.

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and social problems connected with tuberculosis, such as tuberculosis survey, collecting and tabulating tuberculosis statistics, training doctors and nurses in tuberculosis, supervision of sanatorium and dispensary construction and technique, etc. The members of this body prepare films, charts and posters for propaganda and education, promote and co-ordinate research in tuberculosis, collect world news and literature connected with tuberculosis, and edit or contribute to tuberculosis journals in and outside Italy. This body regularly holds conferences on tuberculosis problems in the different provinces in rotation. It also represents Italy on international conferences and organizations.

During the last two years an organized attempt is being made to extend the activities of the federation to the Italian possessions in Africa. The 1937 annual meeting of the federation was held at Tripoli in the presence of a strong force of Italian and foreign representatives presided over by Signor Balbo, Governor-General of Libya.

Training of doctors

The Italian National Federation against Tuberculosis recognized the need for training a sufficient number of doctors in the modern methods of diagnosing and treating tuberculosis, as one of the first steps in a campaign against the disease. Therefore a number of training centres were formed in different provinces, most of them in relation to universities. At present the chief of these centres is the Carlo Forlanini Institute opened in 1934 in a suburb of Rome. This is a large institution affording accommodation for 1,300 patients. To this hospital-sanatorium is attached a clinic for the post-graduate training of doctors, a school for the training of nurses and a model tuberculosis out-door dispensary.

The library has all the clinical records of patients ready for reference, and receives scores of periodicals in all the chief languages of the world, mostly dealing with tuberculosis work in different countries. The laboratory is equipped for all kinds of research. The modern radiological department forms an important unit.

There are two courses open to doctors, one of six months for the general practitioner and another of two years for those who aspire to become heads of tuberculosis institutions. In this institution about a hundred doctors are trained every year.

The institution takes full advantage of the proximity of the metropolis and the university of Rome. The professors of the university, government health officials, such as the director of public health, the inspector of tuberculosis dispensaries, the director of social insurance and others, take part in the teaching programmes. During the course, the students visit all kinds of tuberculosis institutions.

Crores of rupees spent

The Carlo Forlanini Institute has cost 45 million lire for construction and equipment. From 1927 to 1934, three hundred million lire have been spent in sanatorium construction alone.

During the five years 1929 to 1933, the anti-tuberculosis associations in Italy have spent a sum of over 412 million lire for their work. During the same period the Fascist institution for social insurance has spent 850 million lire in anti-tuberculosis work, while the Minister of the Interior has directly advanced 214 million lire for the same purpose. Including the amounts spent by the national association for the protection of women and children, war invalids and Orphans Aid Society, the Red Cross Society, etc., the total amount spent in anti-tuberculosis work in Italy during the five years 1929 to 1933, is 1,645,309,330 lire. Taking the rupee as equivalent to 4½ lire on an average rate of exchange, this amount is over 36 crores of rupees.

Results achieved

The work of the National Federation against Tuberculosis and the expenditure of large sums of money (nearly 2,000 million lire during the six years 1929 to 1934) have resulted in a large increase in the number of dispensaries and sanatoria, and in a remarkable fall in the death rate due to tuberculosis in Italy, as shown by the following figures :—

Number of anti-tuberculosis dispensaries.

1924 ..	108	An increase of 197 in three years.
1927 ..	305	
1934 ..	425	

Number of beds for tuberculous patients.

1924 ..	5,395	An addition of over 30,000 beds within ten years.
1929 ..	26,680	
1934 ..	39,600	

Number of deaths due to tuberculosis of all forms.

1924 ..	60,548	The death rate nearly halved within a period of ten years.
1929 ..	50,169	
1933 ..	35,420	

Certain special features

The campaign against tuberculosis in Italy in its present form is one of the youngest and most vigorous in Europe. In Italy the state is more to the forefront of the movement than in most other countries. The rapidity with which the movement gained strength during the Fascist regime, and the quickness of results achieved, are unprecedented.

The Italian campaign is marked by the special national insurance against tuberculosis. This has been the means by which large sums of money (850 million lire in five years) became available for the campaign. Tuberculosis insurance and invalidity insurance both form part of the national social insurance fund. It is in the interests of the fund that as few people as possible should become permanent invalids on

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ANTI-TUBERCULOSIS WORK IN BENGAL

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Early history

BETWEEN 1882, the year of the discovery of the tubercle bacillus by Robert Koch, and 1900, Indian workers have very occasionally published papers on the subject. But the problem of prevention of tuberculosis in Bengal does not seem to have been discussed until the early years of the twentieth century. It was thought that tuberculosis was rampant among all classes of people in Calcutta, that approximately 10 per cent of the total deaths were due to tuberculosis, and that the prevalence of this disease was far more than that of any of the purely tropical diseases. The names of Waters, Mulvany, Jennings, Harris, Rogers, Pilgrim, Pearse,

(Continued from previous page)

account of tuberculosis. Therefore this fund takes care to see that the disease is diagnosed as early as possible, that beds are provided in adequate numbers, and that the treatment is as prompt and efficient as possible.

It is remarkable that the Italians in their legislation against tuberculosis have not provided for compulsory notification of the disease. They made a study of the working of notification in different countries and came to the conclusion that compulsory notification often fails to serve its purpose, and sometimes is worse than useless. They claim that the system of insurance, apart from the assistance rendered, has the great advantage that anybody who has any suspicion of tuberculous disease will at once go voluntarily to the nearest tuberculosis dispensary or hospital, knowing that he is entitled to free consultation and treatment by virtue of his insurance. Thus nearly all tuberculous cases come under the notice of the dispensaries and clinics. For this reason the Italians claim that statistics about tuberculosis incidence in a country under insurance are much more reliable than those in a country where tuberculosis is by law merely a notifiable disease, but not insured against.

A division of labour or duality of function is present in the Italian organization. The *consorzi* under the Minister of the Interior (Director of Public Health) are in charge of the dispensaries and the preventive aspect of the work. They exercise jurisdiction over the treatment centres in so far as they form part of the preventive scheme. The insurance organization under the minister of corporations looks after the sanatoria and other treatment centres. In practice, these two units are found to collaborate in harmony with each other and with other organizations like the Red Cross Society.

Chatterjee, Crake and Calvert stand out prominently as having contributed to the knowledge of its prevalence and its prevention at the time. From the *post-mortem* records of latent and healed tuberculosis supplied by Rogers and Pilgrim (1909), it was considered that 'under proper conditions of treatment in the sanatorium in the early stages, the prevailing rate of mortality could be largely prevented'. It was further thought that 'such institutions, outside their function as a means of treatment, would serve the even more important one of acting as centres for the spread of knowledge amongst the people of the necessary precautions that should be taken in order to prevent the spread of tuberculosis to those who are healthy'.

Towards the early part of 1909, the Medical Section of the Asiatic Society of Bengal took a prominent part in discussing the tuberculosis problem from various viewpoints. The unanimous adoption of the following resolution, proposed by Lieut.-Col. Pilgrim, Superintendent of the Presidency General Hospital, and seconded by Dr. Pearse, the City Health Officer, shows the concern of the medical profession of the time for some sort of preventive work :—

'The Medical Section of the Asiatic Society of Bengal having discussed the subject of tuberculous disease in Bengal, and its wide prevalence, are of the opinion that it is an extremely common cause of great suffering and mortality, both among the European and Indian communities; and therefore venture to call the attention of the Government of India and the local Government, to the urgent necessity for providing a properly equipped sanatorium for the treatment of early phthisis, such as has now been provided with most satisfactory results in nearly all civilized countries'.

Some of the medical men present at this symposium, notably Chatterjee and Pilgrim, advocated the enactment of legislative measures against indiscriminate spitting and the introduction of compulsory health insurance for housing, treatment and after-care.

We also find a reference, in the old records, that the Maharajadhiraj Bahadur of Burdwan suggested to the Government in 1908 that a sanatorium should be established for the benefit of the members of the poor middle classes suffering from tuberculosis and other diseases and himself offered a contribution of Rs. 1 lakh towards its cost. Sir Andrew Fraser, the then Lieutenant-Governor of Bengal, sympathized with the scheme and appointed a committee to consider it. The committee tentatively selected Simultala as the most suitable site for the proposed sanatorium, and had a plan and an estimate of cost prepared. Excluding the land, the cost of the building and equipment was estimated at Rs. 1,85,000 and maintenance charges at Rs. 14,000 per annum. In 1909, however, it was decided by the Government that the financial position did not permit of the project being

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given effect to, and it was accordingly dropped. Major Deare and the Rev. Mr. Hearn suggested Hazaribagh and Major Calvert suggested Kalimpong as likely places for the sanatorium treatment of pulmonary tuberculosis.

No records are available, however, about any well-considered anti-tuberculosis schemes for the province as a whole. In 1913, the Corporation of Calcutta proposed to establish a dispensary for the tuberculin treatment of consumption and suggested that 'a comprehensive scheme should be framed for the establishment of a tuberculosis hospital and sanatoria in Calcutta'. The introduction of tuberculin treatment at the dispensary was probably suggested by Cochrane and Sprawson at an earlier session of the All-India Sanitary Conference held at Lucknow. The Corporation thought that the question was a very large one which could not be dealt with effectively unaided and asked the Government of Bengal for the statement of their views and policy. While supporting the proposal to establish a dispensary for the tuberculin treatment of consumption, the Government expressed their inability to make any grant towards the establishment of a special hospital and sanatorium. They advocated, however, the initiation of a preventive campaign against tuberculosis along the following lines :—

(*a*) the establishment of an anti-tuberculosis dispensary in a rented building in the central part of Calcutta;

(*b*) the formation by the officer in charge of the dispensary of a Bureau of Information to collect statistics and to investigate important points in connection with the disease.

It was proposed to appoint a whole-time non-practising junior I.M.S. Officer on Rs. 1,000 a month plus staff allowance of Rs. 300 per month, to be assisted by a resident whole-time Assistant Medical Officer on Rs. 250 per mensem. His duties were fixed as follows: (1) to attend to the treatment of out-patients visiting the dispensary; (2) to consult with the medical practitioners in the town as to the advisability of treating some of their private patients with tuberculin; (3) to recommend a system of home prophylaxis in the case of out-patients; and (4) to keep a careful list of all cases notified, whether he ever had an opportunity of seeing the patients or not. The advisability of issuing leaflets, home instructions and all measures of that kind was left largely to his discretion.

This envisaged the introduction of compulsory notification of the disease but it was pointed out that the compulsory disinfection of premises was not to be insisted upon to begin with. A notification fee of Rs. 2-8-0 was proposed to be given to private practitioners notifying a case. It was estimated that the probable annual expenditure in notification fees would amount to Rs. 25,000 a year; and

(*c*) the appointment of a small staff of health visitors (preferably highly trained English ladies) to assist this officer at a salary of Rs. 200 a month with free quarters and a conveyance allowance of Rs. 50 per month. The menial and laboratory staff were also included in the estimate.

The Corporation generally approved of the scheme but were not willing to bear the whole of the cost, which for the first and second year of working was estimated at Rs. 2,500 a month, and accordingly requested that Government might bear half the cost. In reply the Government informed the Corporation that they would prefer to wait the result of Dr. Lankester's inquiries on tuberculosis which was being financed by the Indian Research Fund Association at the time (July 1914 to June 1916).

This inquiry by the Indian Research Fund Association was the direct outcome of a resolution passed at the Madras Session of the All-India Sanitary Conference in 1912 and at the Lucknow Sanitary Conference in 1914.

Dr. Lankester visited 85 cities, including 29 with a population of over 100,000 inhabitants, interviewed doctors, missionaries, educational officers and various institutions in the course of his tour covering 35,000 miles, and he submitted a report which was forwarded by the Government of India, Department of Education, to the various provincial Governments for their opinion early in 1916. The opinions of the local administrations were collected together in a 'blue book' and published by the Government of India in 1918.

On reference to the reports from Bengal, it is seen that it was admitted that tuberculosis was then widely distributed in different parts of the province and that the mortality due to it was considerable. Local surveys were carried out, from time to time, by Rogers (1904), Stewart and Proctor (1906 to 1907), Bentley (1911 to 1912) and others. Figures on tuberculosis were specially collected between 1911 and 1915. This led to the establishment of *small separate phthisis wards in the district hospitals* and dispensaries in the province.

The various other measures proposed were held in abeyance, apparently on account of financial stringency. The Hygiene Committee appointed by the Government advocated regular medical inspection of school children and emphasized the teaching of hygiene in the senior, middle and lower classes of schools. The Governor-in-Council at this time thought that it was desirable that arrangements should be made, as soon as possible, for medical inspection in the schools in Calcutta where the tuberculosis mortality was high. Then came the Great War and all these ideas seem to have vanished from the minds of sanitarians and administrators alike.

The birth of the Jadavpur tuberculosis hospital
1918 to 1923

In 1918, a young medical student from Bengal fell a victim to pulmonary tuberculosis in London and was sent home for treatment. Unfortunately he did not survive; but it was at his

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instance and at the suggestion of his physician, Dr. B. C. Roy, that he made a bequest of his property for the establishment of a tuberculosis sanatorium in Bengal, or failing such an institution, the investment of the property by the Calcutta University for the purpose of founding a scholarship for research in tuberculosis. This benefactor was the late Sj. Provash C. Ghosh. The executors of his will were Sir P. C. Roy, Dr. B. C. Roy and Mr. B. K. Ghosh who, in order to effect the purpose of the testator, made the property over to the Calcutta Medical Aid and Research Society, founded with the object of establishing sanatoria and homes for consumptives. The property bequeathed amounted to Rs. 1,75,000.

The Calcutta Medical Aid and Research Society opened the first tuberculosis hospital in Bengal at Jadavpur, seven miles from Calcutta, with four patients, in the year 1923. This institution has now developed into a fine hospital of 139 beds, with the aid of Corporation and Government grants and public donations. The province of Bengal is grateful to this society and particularly to Dr. B. C. Roy, the late Mr. P. C. Kar and to Dr. K. S. Roy, its indefatigable secretary, for organizing the first tuberculosis hospital within the province.

1924 to 1928

The present writer, who had the privilege of working with the late Professor Calmette at the Pasteur Institute, Paris, and of studying tuberculosis work in various European countries, took up the problem on his return to India in 1923. The result of his first studies on the epidemiology and pathology of the disease in Bengal was placed before the Lahore session of the Indian Science Congress in 1926 and before the Tuberculosis Section of 7th Congress of the Far Eastern Association of Tropical Medicine held in Calcutta in 1927. Since then he has been in charge of the Tuberculosis Inquiry, as an honorary worker, under the Indian Research Fund Association. He took up the thread where it was left by Dr. Lankester and has tried to explain some of the unexplained epidemiological factors, by surveys and laboratory investigation. His public utterances and writings exposed before the profession and in the press helped to focus attention on the seriousness of the problem.

He has tried to point out how the problem differs in urban and rural communities, in tuberculized and untuberculized communities, in contact and non-contact families, in industrial and non-industrial areas, in congested and sparsely populated areas, in conditions of good living and sound community hygiene, and also according to nutrition and environment and other factors. The facts already in our possession at the time helped us to evaluate and diagnose the local problem, to some extent.

He made a further tour in Europe in 1929-30 exclusively studying tuberculosis and anti-tuberculosis work in various countries. He also visited various tuberculosis institutions in India in order to gain a knowledge of local conditions. The full benefit of these visits was given to the study and prevention of tuberculosis in the province. It must be said to the credit of the medical profession in this province that they responded splendidly whenever a call was made for their services in the cause of prevention of tuberculosis.

The Jadavpur Tuberculosis Hospital did not seem to make any further progress during this period but its expansion quickly progressed from the year 1931 onwards. Its present bed capacity is 139, plus 6 beds under construction. Up to date it has received, besides the bequeathed property, a total capital grant of Rs. 1,45,000 from the Calcutta Corporation and Rs. 2,48,500 from the Government of Bengal. The recurrent grants from the Calcutta Corporation from 1931 to 1938 total Rs. 2,81,292. The public donations amounted to Rs. 5,90,334. This progress is no doubt encouraging, but one institution cannot solve the needs of the whole province.

Origin and growth of the Tuberculosis Association of Bengal (1929–38)

In almost every country, it is a private organization sponsored by private funds which, by conscientious and patient work, first demonstrates the need for public health protection in tuberculosis and points the road for further constructive work. The state comes in for legislative action and financial aid at a later stage to help in the realization of an unified control of the disease. It was chiefly through the educative effort and initiative of the National Tuberculosis Association in England that a departmental committee was appointed in 1911 and that Parliament voted a million and a half sterling in the same year besides agreeing to contribute 50 per cent of the net cost of treating the disease. The county and borough councils promptly came forward, with the result that tuberculosis mortality has decreased there by 50 per cent within the last 30 years. Knowing that tuberculosis is chiefly spread by intimate personal and family contact and that a multiplicity of interacting causes, such as ignorance, poverty, low hygienic standards of living, inadequate and bad housing, adverse industrial conditions and unfavourable social environments, operates in determining the incidence of disease in a community, the task of checking the spread of such an ubiquitous disease seemed to be stupendous without state aid, but the matter of starting the Tuberculosis Association of Bengal for the study and prevention of tuberculosis was rather an accident than the outcome of a long-thought-out plan.

Early in November 1928, two American ladies took the writer to see another American lady who was suffering from advanced lung tuberculosis and who died within a few days, under very tragic circumstances. All of us attended the funeral. The pathos and tragedy

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of her life made such an indelible impression on one of the ladies (Mrs. Campbell Forrester), who had previous anti-tuberculosis training, that she made up her mind to work for the cause. On the afternoon of 28th November, 1928, she invited half-a-dozen men and women to confer on the problem of tuberculosis prevention in this province. A committee was soon formed, chiefly through her efforts, with H. E. the Governor of Bengal as President and Dr. C. A. Bentley, the then Director of Public Health, as its first Chairman. This American lady became its first Hony. Secretary and organizer and soon mobilized a band of earnest workers to help in furthering the scheme.

It was decided that a tuberculosis dispensary should be opened 'as a means of demonstrating to the public the practicability of the scheme of anti-tuberculosis work', which embodied :—

'(1) The establishment of tuberculosis dispensaries for the finding by tuberculosis health visitors of suspected cases, the diagnosis of these cases by trained physicians, and, where possible, the segregation of "open" tuberculosis cases.

(2) Systematic visiting of tuberculosis cases and "contacts" in their homes by trained tuberculosis health visitors who teach the special hygiene and prophylaxis of tuberculosis.

(3) Intensive tuberculosis educational propaganda, including general hygiene, preventive and curative measures.

(4) Arrange courses for the training of tuberculosis health visitors, tuberculosis nurses and doctors as tuberculosis specialists.

(5) To encourage the medical inspection of school children, teachers and other employees with a view to safeguarding the young from tuberculosis and educating them in the hygiene of prevention.

(6) To encourage the establishment of hospitals, sanatoria, preventoria and health colonies necessary for dealing properly with the problem of tuberculosis.'

The Association was founded in January 1929, and was registered on 15th June of the same year. The first tuberculosis dispensary was opened in two rent-free rooms offered by the authorities of the Chittaranjan Hospital, Calcutta. The honorary services of some eminent physicians were secured and a special training course was organized to train tuberculosis health visitors. Six months of honest work impressed a neighbouring municipality (Howrah) so much that they financed the opening of a second dispensary at the Howrah General Hospital in October of the same year. A little over 2,000 patients were examined and 2,600 home visits were paid by trained tuberculosis health visitors in the course of the year. A third dispensary was opened at the Medical College Hospitals on the 1st July, 1931. In August 1932, a grant of Rs. 5,000 a year by the Calcutta Corporation enabled the Association to open another dispensary early in January of the next year. An annual grant of Rs. 10,000 by the Government of Bengal for propaganda work, in 1933, enabled the Association to appoint two tuberculosis medical officers and two assistant publicity officers for publicity, education and expansion in the districts and to employ a clerk at the central offices of the Association. The fifth Calcutta dispensary was opened in May 1935, at the Carmichael Medical College Hospital. It was decided to open the sixth dispensary at the Calcutta Medical School Hospital and the seventh one at Sambhunath Pandit Hospital, but lack of funds has stood in the way.

The first *mofussil* dispensary was started at Krishnagar, within the precincts of the Sadar Hospital, in the year 1932. The second *mofussil* dispensary was opened at Dacca in November 1935, and the third one at Kalimpong (Darjeeling) in October 1936. Since then two more dispensaries have been started, one at Darjeeling and another at Barisal.

In most cases, the dispensaries are attached to one of the well-equipped hospitals having *x*-ray installation. The advantages of such an arrangement are obvious—(1) the patients of the locality are already accustomed to approach the existing hospitals in case of illness and hence a large attendance is ensured from the very beginning, (2) the laboratory examinations, as well as *x*-ray examinations, being available in these institutions, the Association is spared any expenditure under these heads, which can thus look after the preventive side of the organization—its legitimate sphere.

The president of the Association is the Governor of the province, who presides at the annual general meetings and gives it such guidance as he may think fit but the management of the Association is vested in an executive committee with a chairman, a vice-chairman, and a committee of 25 members elected from among the members, along with representatives of Government, local bodies, Red Cross and other social welfare organizations. Dr. C. A. Bentley, who was Director of Public Health, Bengal, in 1929, was the first chairman of the executive committee. He was succeeded, on his retirement, by the late Mr. B. K. Basu, an ex-mayor of the Calcutta Corporation, who has been succeeded by Dr. B. C. Roy, another ex-mayor of Calcutta. The executive committee has three sub-committees under it to help the Association in various spheres of work :—

(1) the medical sub-committee, which is responsible for the control and guidance of the academic and technical side of the work;

(2) the finance and publicity committee, which is responsible for raising funds and for guiding publicity campaigns, and

(3) the journal committee, which runs a quarterly journal, first started in 1935.

The volume of work with which the Association is now confronted will be appreciated when we state that, in the year 1937, nearly 70,000 patients were examined at the dispensaries, including about 11,000 new cases, among whom tuberculosis accounted for 4,000 cases. Thirty-one trained tuberculosis health visitors paid 33,765 visits to the homes of tuberculous patients. Many more homes could not be visited for want of an adequate staff. Four thousand

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three hundred and twenty-eight 'contact' cases were traced, of whom 604 were examined; 28.9 per cent of these showed active pulmonary disease. On account of paucity of beds for tuberculous patients in the province, collapse therapy was given to 523 ambulatory cases in the various dispensaries. The manner in which the work is dealt with at a well-organized dispensary is shown in the following scheme in operation at one of our dispensaries (Medical College Hospitals):—

Different sections in the dispensary (No. III, Chest Department, Medical College Hospitals)

I. Male diagnostic section:—
   1. New cases.
   2. Old cases—
      (*a*) Tuberculous.
      (*b*) Non-tuberculous.

II. Female diagnostic section:—
   1. New cases.
   2. Old cases—
      (*a*) Tuberculous.
      (*b*) Non-tuberculous.

III. Children's section:—
   Examination and study of 'contact' cases.

IV. Therapeutic section:—
   A. Injection of chemicals, vaccines, and tuberculin—
      Male side.
      Female side.
   B. Surgical work—
      1. Artificial pneumothorax.
      2. Cauterization of adhesions in A. P. cases.
      3. Aspiration of pleural effusion.
      4. Oleothorax.
      5. Aspiration of cold abscesses.
      6. Phrenic evulsion.
      7. Thoracoplasty.
         (Items 6 and 7—with the help of indoor surgeons.)
      8. Lipiodol bronchography.
   C. Assessment of progress and prognosis—
      (*a*) Estimation of sedimentation rate of blood and von Bonsdorff blood counts.
      (*b*) Estimation of vital capacity.
      (*c*) Taking of weight, pulse and temperature.

V. *X*-ray diagnostic and radiation therapy section—to come into operation at an early date.

VI. Indoor tuberculosis wards—containing 24 beds.

VII. Teaching:—
   Under-graduate—
      Students of the 5th year class are deputed for training for a period of one month in this section.
   Post-graduate—
      (*a*) Post-graduates who come here for training for a three months' course from Bengal and other provinces—throughout the year.
      (*b*) D.P.H. students who are sent for lectures and demonstrations by the All-India Institute of Hygiene and Public Health.
      (*c*) Post-graduate course of the King George Thanksgiving (Anti-tuberculosis) Fund for approximately 30 doctors from all over India for a period of one month in the year.
      (*d*) Post-graduate course for medical and public health officers in Bengal, under the auspices of the Public Health Department.

VIII. Statistical section:—
   Helped by a statistical clerk supplied by the Tuberculosis Association of Bengal.

Staff and duties:—

Number	Designation of post	Duties allotted
1	Senior visiting physician in charge.	General supervision; correspondence; teaching of students; in charge of indoor and outdoor cases; consultation work in other groups of hospitals including the Carmichael Hospital for Tropical Diseases.
1	Junior visiting physician.	Helps on alternate days.
1	Clinical tutor	Demonstration of cases to students and post-graduates and in charge of surgical work and A. P. room.
1	Senior house physician.	Indoor work; including medical help and registrar's work; in charge of instruments and property in the department; deals with outdoor cases, if he finds time.
2	Junior house physicians.	1st Jr.—Male new cases—examination and disposal; roll call of students and filling of schedules. 2nd Jr.—Female new cases.
6	Clinical assistants.	Children's section, male and female old tuberculous and non-tuberculous cases.
2	Clinical pathologists.	Work in the laboratory (senior pathologist is in charge of apparatus and chemicals).

N.B.—All the above staff are honorary.

Nature and extent of work done in Dispensary III, during 1935, 1936 *and* 1937

	1935	1936	1937
1. Total number of cases (old and new).	26,485	30,872	33,205
2. New cases only ..	5,881	6,179	6,672
3. Laboratory examinations—			
Sputum ..	2,907	3,638	3,811
Blood ..	1,820	2,156	1,385
Urine ..	1,474	1,326	1,727
Stool ..	65	88	102
	6,266	7,208	7,025
4. Operations—			
Primary A. P. ..	153	174	251
Refills of A. P. cases.	2,096	2,476	3,198
Phrenic evulsions	36	20	48
Thoracoplasty ..	1	2	5
Removal of pleural effusion with gas replacement.	30	54	52
Oleothorax ..	6	18	15
Lipiodol bronchography.	182	168	208
5. Injection of chemicals, vaccines and tuberculin.	1,984	2,016	2,184
6. Reading of *x*-ray films (twice a week).	2,380	2,257	2,071
7. Radioscopy and radiation therapy—to be introduced at an early date (now being done in the central *x*-ray department of the hospital).			

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Work done by tuberculosis home visitors at Dispensary III

The services of nine or ten paid tuberculosis home visitors have been kindly lent by the Tuberculosis Association of Bengal. They help in writing up the cards of patients, take temperature and weight, write up the *x*-ray requisition forms and are in charge of the card-index system of case cards, *x*-ray and other records. They also prepare patients for examination and operation. In the evening, they carry out their home visits to registered patients.

* * * *

A large amount of work was done by the statistical section. The publicity department of the Association gave 300 lectures in schools, apartments in central Calcutta wherefrom the publicity work of the Association, under two paid publicity assistant officers, is directed. All the health visitors of the Association, male and female, had to pass through a course of training and to pass an examination before they were employed on grades of pay varying from Rs. 35 to Rs. 100 per month. They are paid a small conveyance allowance for their health visiting work. The work of the health visitors is supervised by one of the tuberculosis medical officers and 2 per cent of the health visits are personally checked by him. One of the tuberculosis medical officers is specially meant for publicity, supervision and expansion work in the *mofussil*. The dispensaries, both in the town and in the *mofussil*, are inspected from time to time and a report

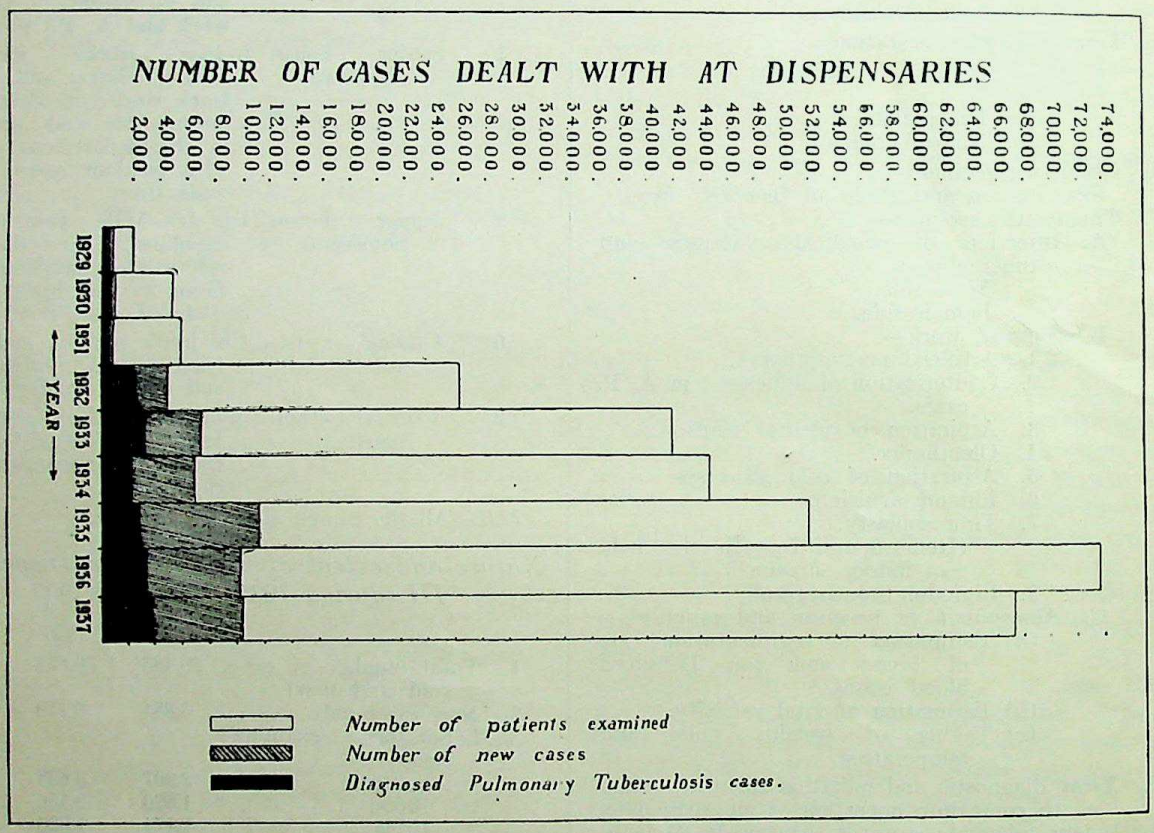

Fig. 1.

bustees, public places and health exhibitions and participated in 18 exhibitions in Calcutta and 8 exhibitions in the *mofussil*.

Figures 1 to 5 show at a glance the growth and activities of the Association during the last nine years.

Staff and organization

The secretary of the Association has always been an honorary worker, except for a short break in 1937. The administrative offices are located, for the present, in some rent-free rooms in the Writers' Buildings, Calcutta, where the only paid staff consists of two tuberculosis medical officers, a clerk and a peon. The Association also maintains a publicity office in rented submitted to the Association. All the dispensaries recognized by the Association now employ standardized methods of diagnosis, classification, charting, follow-up and recording.

The honorary secretary is the main pivot round which every activity of an association like this revolves. He or she has not only to manage the work of the office, but to see that the important work of health-visiting is done properly and to visit the infected homes in slum areas from time to time, to arrange about the instruction and examination of tuberculosis health visitors, to organize the publicity work and the expansion of mofussil work, to activate and co-ordinate the work of the various committees, to devise means of implementing a deficit budget, to organize fund-raising campaigns,

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to receive and answer the questions of various patients and members of the public, to look after the publication of the journal and to think out methods of improving the quality and quantity of work. It is a serious strain on the time of any volunteer worker to perform such multifarious work but we are glad to state that every one of them responded splendidly to the call. Dr. Mrs. C. O. Remfry, who succeeded the first Founder-Secretary (Mrs. Campbell Forrester), rendered the longest period of disinterested service (seven years). Efficiency and progress of work demand that there should be loyalty and discipline on the part of officers and perfect co-ordination between the office-bearers of various committees. This we had in abundant measure.

when first detected at the dispensary shows where the problem stands. To discover and isolate all infective cases in institutions may be an ideal plan but it will remain a pious wish in this country for many years to come.

It has been noted by us that roughly one third of all patients coming to the dispensary prove to be suffering from tuberculosis, a majority of whom are cases of pulmonary tuberculosis. Fifteen per cent of them are in stage I, 25 per cent in stage II and 60 per cent in stage III. The remainder consists of non-tuberculous lung diseases, like abscess and gangrene of the lungs, bronchiectasis, bronchitis, asthma, etc., and also diseases not referable to the lungs. It has also been noticed that approximately 15 to 20

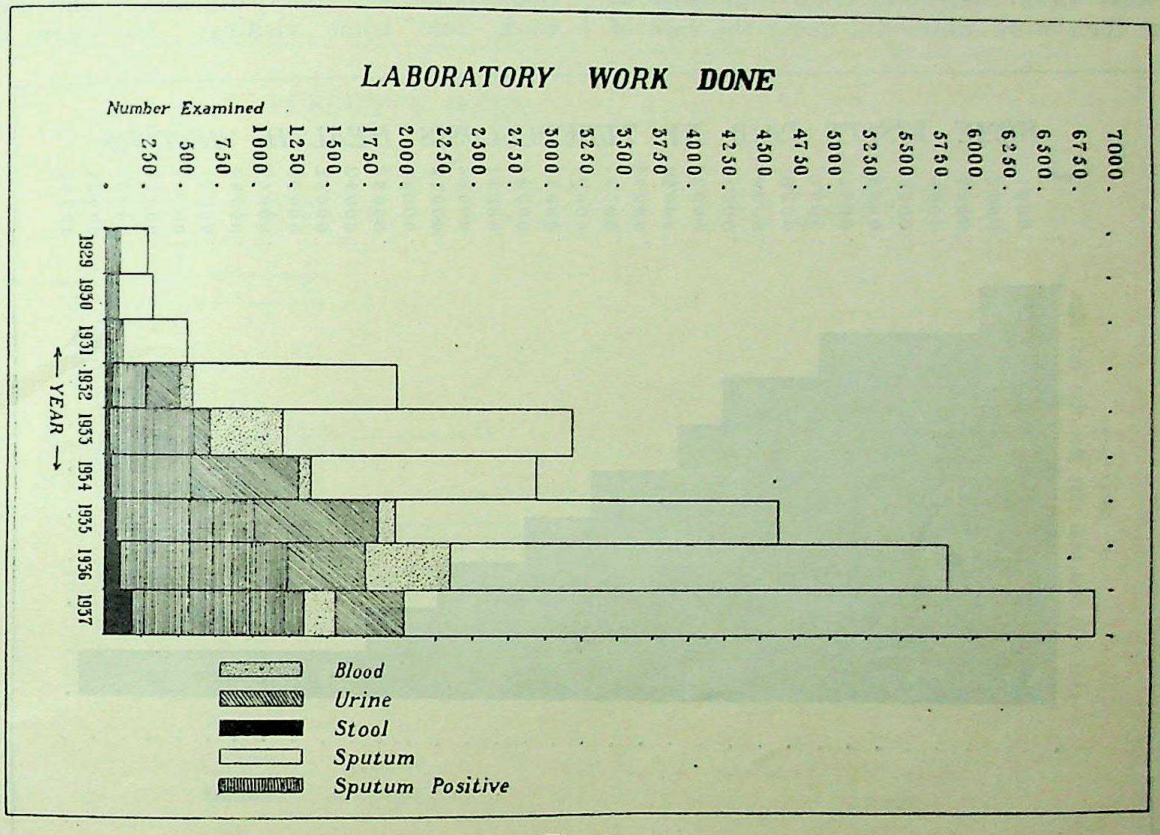

Fig. 2.

Working methods of the Association

We realized from the very beginning that in a province where the annual mortality from tuberculosis was in the neighbourhood of 100,000 and the total bed capacity for tuberculosis patients was only 476 (up to May 1938), we could not possibly isolate any appreciable proportion of the infective cases in hospitals and sanatoria. Moreover, it is recognized that hospitals and sanatoria themselves cannot meet the needs of tuberculosis in the average community. Tuberculosis therapy, therefore, in most instances, must be provided through the medium of home treatment; and the dispensary is but an avenue through which such cases could be approached. The fact that a predominantly large proportion of cases (55 to 60 per cent) are already in advanced stages of the disease

per cent of the cases can be given ambulatory surgical treatment at the dispensary, 25 per cent will require hospitalization, 40 per cent will be found to be too advanced for dispensary or hospital treatment and are thus suitable for being placed in a hospital or infirmary for advanced cases and 20 per cent have been found to be suitable for care colonies or for canvalescent homes. Twenty per cent of the 'contact' children who have been found to have active lung infiltration will be found suitable for institutional care either in a children's sanatorium or in a preventorium. About 10 to 15 per cent of the total number of the tuberculosis cases in the community will be found to be suffering from glandular and bone tuberculosis. For them, there are no special institutions in India to-day. The above facts are mentioned

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in order to help us to evaluate the problem in some of its aspects.

In countries where the bed capacity is large, the dispensary serves as a clearing house for cases meant for admission into various types of institutions. But in India the situation is different. Hence, the experiment of giving collapse therapy in suitable ambulatory cases was first tried in one of our dispensaries (Chest Department, Medical College Hospitals, in 1931). The results were found to be very encouraging —about 70 to 75 per cent of the cases showed positive results (*i.e.*, 'improved') at the end of the year and 65 per cent of the cases with 'positive sputum' became negative at the end of the year. Many cases, which could not otherwise have been controlled, were thus able to resume their work while still under the care of ensuring a good quality of anti-tuberculosis work.

(a) Tuberculosis health visitors' course

Candidates were obtained from some of the matriculates and passed students of the medical schools but we found a great difficulty in obtaining a suitable type of female health visitor. A simple curriculum was drawn up and eminent scientific workers were requested to run the course, who most gladly took up the work as a labour of love. The course has been greatly improved with the passage of time and the present one covers a period of six months during which the students have to attend 80 theoretical lectures, besides demonstrations, practical classes, dispensary and hospital work, and home visiting. As there is no

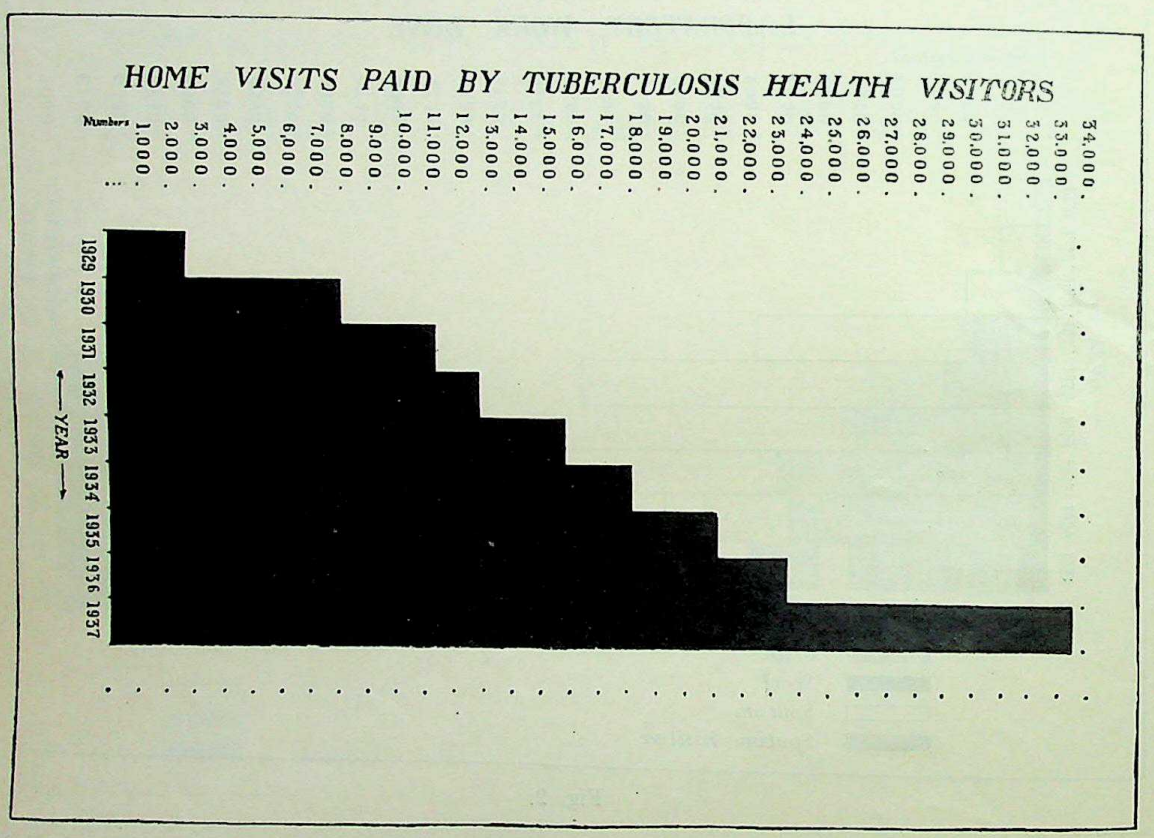

Fig. 3.

the dispensaries. Under this arrangement, the dispensary served as a centre for diagnosis, treatment and education of the patient and his home became an extension of the dispensary, through the help of tuberculosis health visitors. The dispensaries in this country must, therefore, be supplied with a few beds for the observation and treatment of cases, in the initial as well as later stages of the development of anti-tuberculosis work.

A. SUPPLY OF TRAINED PERSONNEL

When the Association was first started we had no trained health visitors and very few doctors with special training in tuberculosis, although we knew that this was a very important item in

other centre where this training is available in India, the Association has been requested, from time to time, not only to train health visitors from other provinces but also to supply passed health visitors to different areas. Some people suggest the employment of sub-assistant surgeons as health visitors. Our experience with regard to them has been disappointing, for in several instances passed doctors who had this training and were employed as such engaged surreptitiously in practice as tuberculosis specialists. We have since stopped the training of qualified doctors as tuberculosis health visitors. The training of nurses as tuberculosis health visitors has been suggested. This has also been tried by us but their employment is more costly

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and is very often beyond the resources of local bodies or tuberculosis organizations.

A difficulty seems to have cropped up, at least in this province, regarding the name 'tuberculosis health visitor', as hitherto the name 'health visitor' has been given to ladies who have taken maternity training. The present Act does not, therefore, permit the use of the term 'health visitor' to our health visitors. We have since commenced styling them 'tuberculosis home visitors'. When the All-India Association is inaugurated, we hope that this difficulty will be rectified.

(b) Post-graduate training in tuberculosis

A short post-graduate course on tuberculosis was organized by the writer in the year 1931 by inviting eminent physicians, pathologists and surgeons of the city to lecture in the class. Besides this, short intensive courses of training were also organized, but in these cases only doctors from Bengal attended. When the King George Thanksgiving (Anti-Tuberculosis) Fund started the first post-graduate course in 1935, the Bengal courses were suspended. The Government of Bengal have recently made arrangements to give a month's post-graduate training in tuberculosis to medical and health officers in the districts, in collaboration with the Tuberculosis Association of Bengal. Besides this, the Association also participates in training, on the preventive side of tuberculosis, for D.P.H. students at the All-India Institute of Hygiene and Public Health. The courses of post-graduate training hitherto pursued by us are in the nature of 'refresher courses' rather than attempts to make the doctors competent to take charge of tuberculosis institutions like hospitals or sanatoria. If we are to attempt this, a longer and a more thorough course of training is needed.

We have always felt that the under-graduate training in tuberculosis in our medical institutions is extremely inadequate. There is no standardized curriculum and no uniformity in the quality and quantity of education imparted on this subject. In the interests of the future of the medical profession and of anti-tuberculosis work generally, we feel that this state of affairs should be remedied.

When the Association first began to open the dispensaries, we did not possess enough specially trained doctors for anti-tuberculosis work in the city and in the districts. We were compelled, therefore, to appoint many doctors who, though they were good clinicians, did not possess the requisite knowledge of anti-tuberculosis work. But we devised two procedures for supplementing this deficiency :—

(1) by organizing post-graduate lectures in tuberculosis which they were invited to attend and,

(2) by holding periodical meetings—clinical, scientific and administrative—of all doctors working under the Association. At these meetings not only scientific matters were discussed but also those connected with the improvement of technique of anti-tuberculosis work. This method was found very useful to ensure the

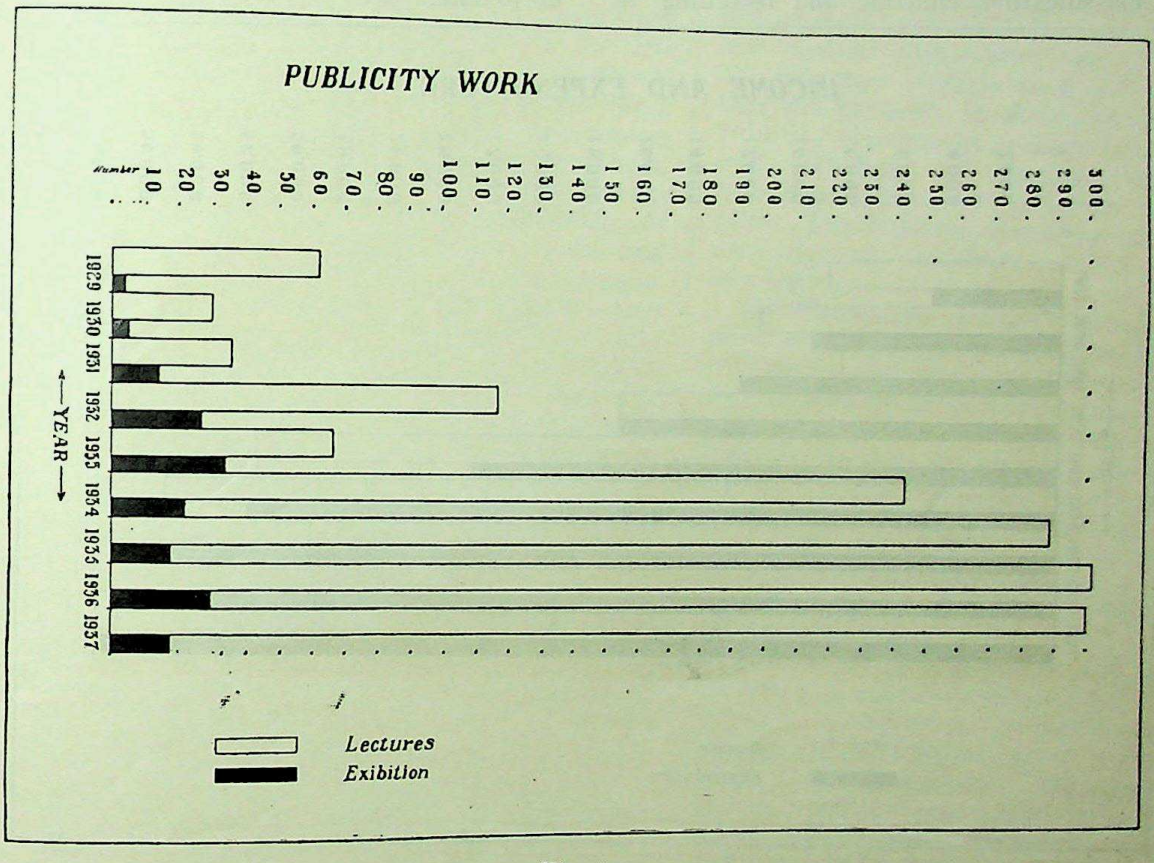

Fig. 4.

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necessary co-ordination and uniformity of procedure. In order to appreciate the difficulties of health visiting work and to ensure better results, joint meetings of tuberculosis health visitors and the dispensary doctors are held from time to time.

(c) An attempt has also been made to give short courses of training to health visitors working under the ward health associations of the Calcutta Corporation. Sanitary inspectors in the Public Health Department may conveniently be included under this category.

B. Development and standardization of technique

A continuous effort has been made to develop and standardize methods of diagnosis, treatment, classification, charting and recording of cases and of surveys and supervision. The following are some of the items which have been standardized and followed at the various dispensaries under the Association :—

(1) Technique and interpretation of the Mantoux and von Pirquet tests.

(2) Minimum standards in the diagnosis of the childhood and adult types of tuberculosis.

(3) Classification and charting of cases.

(4) Laboratory and *x*-ray technique.

We have not yet been very successful about the standardization of the laboratory and *x*-ray technique, chiefly because the different hospitals where such work is done are not under the control of the Association but we hope gradually to achieve success in this direction also.

(5) Standardization and recording of case cards. With the kind co-operation of the Department of Vital Statistics at the All-India Institute of Hygiene and Public Health, the Association has been able to evolve a comprehensive 'case card' which attempts modern statistical analysis. With the help of these case cards, we are now able to analyse many valuable data which were so long left untabulated.

The checking and supervision of the work of health visitors and of statistical analysis, and the procedure of after-care and follow-up, have been standardized by appropriate methods.

(6) Periodical 'refresher courses' are held from time to time for the benefit of tuberculosis health visitors working under the Association, in order to revise and bring their knowledge up to date.

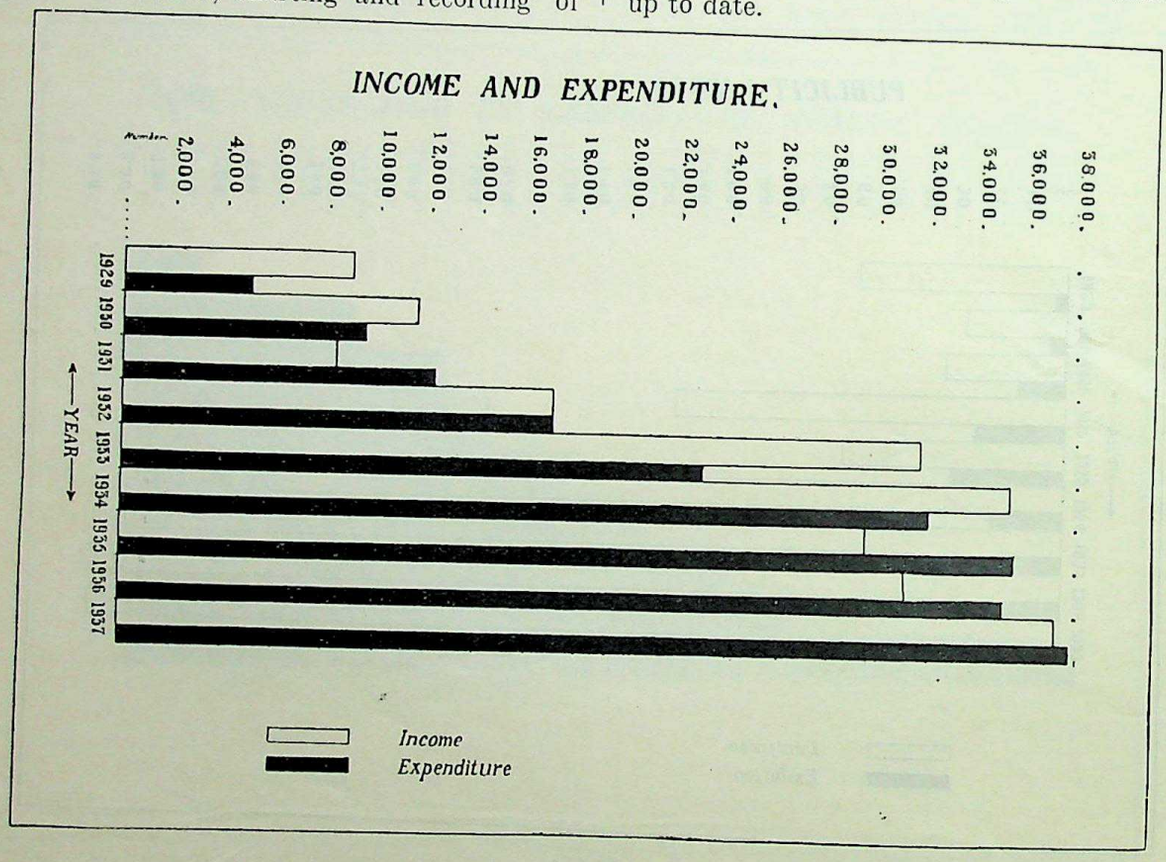

Fig. 5.

(7) Procedure and checking of home visits.

In addition to filling up the 'home-visiting cards' the tuberculosis health visitors have to explain the methods of prevention and effective isolation in the home, the adjustment of their family budgets, the balancing and supplementing of their diet, and to ask them to look on the dispensary service to patients with a friendly eye. The health visitors have to be extremely careful and tactful in visiting work, as the least amount of publicity may lead to the patient-tenants being compelled to leave the premises.

(8) Surveys.

(9) The minimum requirements regarding accommodation, equipment, working and

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affiliation of dispensaries have now been standardized and no dispensary is affiliated to the Association which does not conform to the minimum requirements. When a dispensary is affiliated to the Association, the latter deputes one of its tuberculosis medical officers to initiate the work and lends the services of a tuberculosis health visitor for the first three months. It also supplies, at cost price, printed case cards, return forms, registers and propaganda material. Technical advice is also given free and a copy of the journal of the Association is supplied without obligation.

(10) Notification and registration.—Until recently, tuberculosis was not recognized under the category of 'communicable diseases'. At the persistent request of the Association, the Government of Bengal declared tuberculosis to be a 'notifiable disease' only in municipal areas, except Calcutta, in Bengal on the 3rd August, 1936. The Municipality of Calcutta has also recently declared it to be a notifiable disease. It is to be regretted that very few municipal agencies and members of the profession have complied with the provisions of this Government order. The Tuberculosis Association of Bengal notified 809 sputum-positive cases and 240 tuberculosis deaths to the Calcutta Corporation and 288 sputum-positive cases and 74 tuberculosis deaths to *mofussil* municipalities and district boards in the year 1937, but it is regretted that the response has so far been very discouraging and that proper preventive measures were seldom taken. It is felt that if the municipal and district board laboratories undertook to examine, free of charge, the sputum of all suspected cases sent to them by qualified medical practitioners, the notification of 'open' or infectious cases would be facilitated and a wider application of preventive measures rendered easier.

We are aware that notification involves some possible inconvenience to private practitioners and patients, unless provision is made for the institutionalization of patients. But even with these drawbacks, I believe that a beginning should be made with notification, in spite of its manifest disadvantages at the present moment.

(11) Legislation.—Efforts have been made to introduce a short *ad hoc* Tuberculosis Act, through the Government of Bengal, but the chief difficulty which confronts its introduction and application seems to be the lack of tuberculosis beds in the province and of the provision of an Act based on the health insurance system.

C. Tuberculosis survey

The scientific basis of a tuberculosis programme was recognized from the very beginning. As the crucial factor in the control of the disease is the prevention of 'large dose' infection, one of the first steps in the prevention of such infection must necessarily be the finding of the cases. The rôle of the survey in dispensary procedure is therefore of very great importance. The Association has undertaken surveys of educational institutions, work houses, orphanages, tuberculous homes and of selected areas and towns and villages. The work of the present writer, under the auspices of the Indian Research Fund Association, on the epidemiology of the disease in urban and rural areas, in tuberculous homes and in industrial areas has been greatly aided by the staff of the Tuberculosis Association of Bengal. Fresh knowledge gained from these surveys has no doubt helped us to improve the working methods of the Association.

D. Publicity and extension

The value of a well-planned campaign of health education for the lay public was recognized by us from the very beginning. Until the Government grant in 1933 enabled us to appoint two medical officers and two publicity officers our volunteer workers took the task of education and publicity on their own shoulders. Our publicity department is now fairly well organized. We have to examine the old methods from time to time and introduce new ones every year. The following are some of the important methods of publicity which have been developed :—

(*a*) Newspaper publicity, which includes the publication of news items, short stories, reports of lectures and meetings and results of surveys and anti-tuberculosis campaigns.

(*b*) Use of printed work, which consists of leaflets, circulars, reports and posters. The Association has been running a quarterly journal for the purpose of lay health education since the year 1936. It contains information on the activities of the Association, articles on various aspects of tuberculosis, facts and figures, and other useful items.

(*c*) Use of spoken word; lectures and talks are given in schools, colleges, university classes, teachers' associations, in public places, parks, *bustees* and exhibitions and over the radio.

(*d*) Graphic methods. This includes exhibits, posters, special tuberculosis films, charts and graphs, slides, etc. Dramatic displays have been occasionally utilized. Special attention has been devoted to publicity in schools and colleges and efforts have been made to rouse interest in anti-tuberculosis measures by offering prizes for essays on tuberculosis.

Most of our dispensaries, which are attached to teaching hospitals, take part in undergraduate and post-graduate medical education. The dispensaries also take part in the education of the patients assembled there by asking the health visitors and publicity officers to lecture to them on early detection, prevention and vocational rehabilitation.

Well-organized publicity is very necessary for extension work either in the city or in the *mofussil*. Although our medical and publicity officers have been touring the *mofussil* for several years, the response has been rather poor. As a

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result of the efforts for the last 10 years, only five *mofussil* dispensaries have hitherto been opened. The chief difficulties which have stood in the way of opening more *mofussil* clinics are that the municipalities and district boards do not come forward to contribute a substantial portion of the recurring expenditure. Public enthusiasm has also been found freakish and undependable in a large number of places. To my mind, a lack of civic consciousness, tenacity and the 'will to live' has been responsible for such a poor response in extension work. As the dispensary is the field unit from which anti-tuberculosis activities emanate, we are insisting not only on the opening of more clinics in the city and in the *mofussil* but are also trying to impose on them certain conditions for affiliation in order to ensure a uniformity of working methods throughout the province. Where *mofussil* centres are not affiliated, we have found it extremely difficult to exercise the necessary supervision and to introduce uniform procedures in diagnosis, treatment and follow-up work.

We are ashamed to note that in a province with a population of 4.6 crores we have got only one tuberculosis hospital of 139 beds, and that in the suburbs of Calcutta. A scheme for establishing a climatic sanatorium for this province was formulated in 1935. A Government committee was appointed to select a suitable site and the entire capital expenditure of the scheme amounting to about Rs. 3 lakhs was obtained from a Marwari philanthropist. The committee unanimously selected a site in the Kalimpong hills but, for some unexplained reason, the Government has not yet been able to start the sanatorium. But a small beginning has been made by the authorities of the Calcutta Medical Aid and Research Society in establishing a small sanatorium for non-pulmonary and convalescent pulmonary cases at Kurseong in the Darjeeling district (1937), which has provision for 24 patients.

We should like to refer to a very unreasonable objection on the part of the public in many parts of Bengal against the establishment of tuberculosis institutions in the neighbourhood of, but well removed from, towns. The funds for the establishment of a tuberculosis hospital 23 miles from Calcutta (Rs. 1,15,000) and of a sanatorium near Kalimpong (Rs. 3 lakhs), obtained by donation from two philanthropic citizens, have been lying idle for over three years, owing to uninformed criticism and objection from the residents of the neighbourhood. It is now accepted in all parts of the world that modern scientific hospitals and sanatoria are rather safeguards to the health of the locality, far from endangering it in any way. We feel that the State should intervene and override all such objections; otherwise, the establishment of tuberculosis institutions will be well-nigh impossible in any part of the province. It is realized that suitable educative propaganda should, at the same time, be carried on to transform the views of the public.

E. Co-operation with other public health bodies

We have had a very happy relationship as regards co-operation and co-ordination with the Public Health Department of the Government of Bengal and with the Red Cross Society. We cannot say the same thing in the case of municipalities and district boards, most of which do not seem to have appreciated the seriousness of the problem and their duties in relation to it, or their inactivity must be due to the proverbial lethargy of our people. In any case, it seems to us that it is worth while educating the members of the self-governing bodies to help them to form a sympathetic opinion about the problem and the measures proposed to cope with it, so that they may take energetic action. We have also noticed a certain amount of duplication of effort regarding publicity methods employed by the Public Health Department of the Government and local bodies. It is a matter for consideration how far our respective efforts in these directions should be co-ordinated to avoid overlapping, to secure economy and to achieve better results.

We realized from the very beginning that the general practitioner was the backbone of the profession and that he was an important key to the application of anti-tuberculosis measures in the family. It is a matter of regret that the profession in general, in this province, has not yet responded by coming forward to consult the dispensaries for diagnosis, advice, follow-up and notification to the extent that we desire them to do. The private practitioner should be made to realize that the Association's activities are only complementary to his position as a family physician. This aspect of the work requires further consideration from all anti-tuberculosis workers.

We have tried to establish a close contact with the education department and with the maternity and child-welfare clinics. We have not been satisfied with the progress so far made in both cases. Two reasons may be ascribed to the poor progress in school medical inspection regarding tuberculosis :—

(*i*) The educational authorities have not yet fully realized the significance of the fact that a large number of students and teachers fall victims to tuberculosis in the prime of life, and that it is of the utmost importance to detect and take care of these persons in order to safeguard the health of the rest. I would even say that the educational authorities ought to make suitable arrangements, by establishing their own clinics and sanatoria, for the proper diagnosis and treatment of such cases, by introducing some sort of health insurance system, as prevails in German universities.

(*ii*) The inadequate medical staff of the department, who are not specially trained in tuberculosis, cannot render effective service and co-operation in this direction.

As regards maternity and child welfare clinics there ought to be more co-operation than we have at present. It seems to us that periodical joint meetings of the medical and health

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visiting staffs of these two organizations might be useful in achieving the desired end.

The importance of the follow-up and after-care of cases treated at the dispensary or discharged from hospitals or sanatoria has been recognized from the very beginning. We cannot say that we are satisfied with the progress made in this direction. The Association printed 'after-care notification cards' and distributed them to different hospitals with a request to refer all discharged tuberculosis cases to the care of one or other of the recognized dispensaries. But we regret to note that in a very few cases is this done by the authorities of tuberculosis wards, hospitals, and sanatoria. Surely, the time has come for a better relation and co-ordination for a common purpose in this direction.

In spite of our best efforts we have not been able to develop 'care committees' in touch with the dispensaries. This has been partly due to the apathy of the population but chiefly to the absence of social insurance organizations in this country. An attempt has, however, been made to give additional nourishment to deserving cases from the funds of the Association but a central organization like the Tuberculosis Association of Bengal cannot set free adequate funds to supply the needs of a large number of deserving cases in this direction. One fact has, however, been observed which is worth recording—wherever additional nourishment (milk, fruits and cod-liver oil) has been given to indigent patients in their homes, an increase in weight and an improvement of the general condition have been generally noted, so that any money which can be spent in this direction will be well spent. In the absence of regular 'care committees', the Association has fought for the reinstatement of 'arrested' cases, who were wrongfully discharged by their employers without sufficient reason, and has succeeded in some cases.

As regards the re-instatement of arrested cases among the Government employees, the Association has been able to induce the provincial sanitary board to ratify certain standards for the re-employment of such persons. The Association is now trying to influence the opinion of big employers of labour, like the railway companies, to accept these recommendations. The criteria for temporarily or permanently invaliding employees have also been drafted and accepted by the sanitary board.

As a result of representations made to the Government of Bengal, a tuberculosis sub-committee of the Bengal sanitary board was formed early in 1935. The Association has three representatives on this committee—the honorary secretary, the chairman of the medical sub-committee and the health officer of the Calcutta Corporation. The Association is also represented on the Bengal provincial sanitary board. Our representatives on these committees have fought for a proper notification and registra[illegible] cases, for post-graduate education and [illegible] cognate matters. Certain legislative mea[illegible] are under the consideration of this committee [illegible] present.

The present position with regard to certa[illegible] types of institutions and their co-operation wi[illegible] the dispensary organization is shown in th[illegible] following diagram of a complete anti-tuber[illegible] culosis scheme. The defects in the present Bengal organization are indicated by the sign plus (+).

Finance

During the first three years, the sources of income were membership subscriptions (life a[illegible] ordinary) and donations, a grant by the Howr[illegible] municipality, contribution from the Bengal Health Welfare Committee (Red Cross) and the sale of two million 'health seals' presented by the National Tuberculosis Association of America. These seals used to fetch an income of Rs. 4,000 to Rs. 5,000 every year. Ladies used to take a prominent part in the sale of these seals, which was further facilitated by the co-operation of the various post-offices in the city. The Indian Red Cross Society showed their practical sympathy from the very beginning by advice and contributions. The King George Thanksgiving (Anti-tuberculosis) Fund, which was inaugurated in the same year as the Tuberculosis Association of Bengal, has regularly given a grant of Rs. 3,000 to Rs. 4,000 a year since 1932. In the year 1932, the sale of anti-tuberculosis matches, prepared and printed in England, was given a trial. But this did not seem so popular as the health seals. This method of raising money was subsequently replaced by the organization of an anti-tuberculosis flag day.

Our flag-day organization has now become a comprehensive and effective procedure in raising funds for anti-tuberculosis work, as will be judged from the fact that we collected Rs. 7,750 in 1937 and Rs. 9,600 in 1938. A complete list of the areas, workers and prospective donors and subscribers is kept in the office and is being constantly enlarged. It is hoped that the more comprehensively we reach the public the higher will be the collections in future. A thorough publicity organization is very necessary for the success of such collections.

It has been stated before that the Government of Bengal has been giving a contribution of Rs. 10,000 a year from 1934, and there is a grant of Rs. 4,750 by the Calcutta Corporation. The Bengal provincial branch of the Indian Red Cross Society has given Rs. 1,500 a year. Besides these supports, private agencies, such as the Royal Calcutta Turf Club, the Alexandra Rose Day Fund and various commercial firms have given liberal support to the funds of Association.

It may be mentioned here that th[illegible] seals' campaign has not been give[illegible]

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in this country. From our three years' experience with it, we firmly believe that it is likely to prove to be a great source of income if properly organized. It may be of interest to know that the seal sale campaign which was first introduced in Denmark in 1907 and later in the U. S. A. in the same year has proved of great help in supplying funds for anti-tuberculosis work. The seal sales in U. S. A., which fetched 3,000 dollars in 1907, fetched 5,500,000 dollars in 1930. A method of collection by which the largest number of people can be reached serves more than one purpose—(*i*) it helps to raise funds and (*ii*) it changes the mental outlook of the general population towards the tuberculosis campaign. The student community in Bengal has proved to be one of our best supporters in our fund-raising campaigns. Women workers have also been our staunchest supporters.

An idea of the different sources of revenue will be judged when it is stated that in the year 1937 the Tuberculosis Association received Rs. 21,500 from grants from various sources enumerated above, Rs. 450 from ordinary membership fees, Rs. 1,200 from life membership fees, Rs. 7,500 from the flag-day collections, besides smaller donations in cash and kind from various firms and associations. Thus, apart from the grants, the Association had to raise over Rs. 16,000 for its general expenditure.

Building fund

A fund was started in the year 1935 for building a permanent headquarters office and clinic fitted with *x*-ray apparatus. The fund stood at Rs. 17,000 at the close of 1937.

The Association took part in the building of an annexe at the Jadavpur Tuberculosis Hospital for poor Anglo-Indian patients. Late in September 1931, the Presidency General Hospital, which has been caring for a certain number of advanced tuberculosis cases in the verandahs of the wards, found it necessary to evacuate these patients, eleven in number, owing to financial stringency. The Association arranged for housing and nursing them in a temporary shed at the Kidderpore parsonage, until sufficient funds were raised, through the kind co-operation of the Metropolitan's Committee, the Red Cross Society and the Rotary Club of Calcutta, to construct an annexe at Jadavpur for their accommodation and treatment. A part of the recurring expenditure is obtained from the Red Cross Society, the District Charitable Society and other sources.

X-ray fund

An *x*-ray fund, called the 'Kalyani *x*-ray fund', was started in 1936 for supplying free [illegible]ray facilities to indigent tuberculous patients. [illegible]nd now stands at Rs. 1,500.

Nourishment fund

[illegible]n made an attempt to start a [illegible]' from the beginning but their efforts in this direction have not been very successful. Only Rs. 320 were collected in 1937. We feel that this work should be legitimately delegated to 'care committees' in the dispensary areas. The invested funds of the Association now amount to Rs. 25,000.

Appreciation

A silver challenge shield, called the 'Hassan Masud Suhrawardy Memorial Shield', was

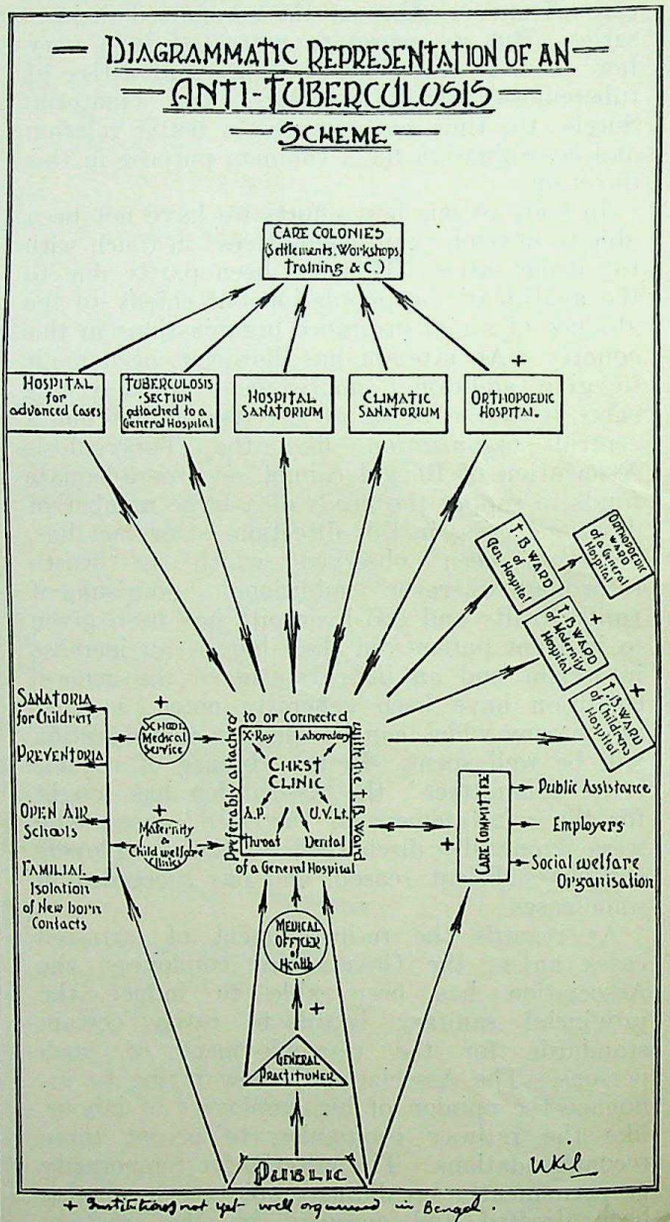

Fig. 6.

placed at the disposal of the King George Thanksgiving (Anti-tuberculosis) Fund by Sir Hassan Suhrawardy, an eminent medical man of Bengal; offering it annually to any corporation, municipal council, or municipal committee, or any other organization, association or committee doing anti-tuberculosis work in British India and the states, which showed the best anti-tuberculosis activities during the

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year. The Tuberculosis Association of Bengal won the shield twice—in 1934 and 1937—in appreciation of its work.

An ever-increasing demand from the neighbouring provinces for facilities for anti-tuberculosis training under the auspices of the Tuberculosis Association of Bengal shows that its working methods are being appreciated far beyond its own territories. The different committees of the Association are keenly trying to perfect the working methods every year. Although a fair amount of progress has been made, much remains to be done yet; so there is need for a continuous study and progress.

The problem and the future

The problem of prevention of tuberculosis in this country is complicated by the fact that we have to deal with a country which is chiefly rural, where the population is largely uninfected or imperfectly immunized *vis-à-vis* the tubercle bacillus and where education is so backward. The home survey and public health education of such an enormous population is a matter of considerable complexity. The problem of the rural areas differs considerably from that of the endemic towns and cities containing a large number of people within a small area, where special problems like overcrowding and insanitary surroundings have to be fought by a better housing and town-planning campaign. The problem differs still further in industrial areas where, apart from the hazard of the trades, a large number of uninfected rural people are brought together and made to live under conditions which favour large-dose infection. Thus, measures for the amelioration of overcrowding, under-nourishment and trade hazards in industrial areas also come within the sphere of activities of a tuberculosis association.

It has been noticed that an increasing number of rural people who migrate to highly endemic cities or industrial areas as students, young females, clerks, menials, indentured labour, etc., fall victims to the disease more frequently than urban people. Their protection by the administration of a protective vaccine, like the B.C.G. vaccine of Calmette, should receive serious consideration from all public health authorities.

It has been noted that, if cases are detected early and are treated on modern scientific lines, the results of treatment are as good here as in European countries. The question of early diagnosis, therefore, is an important one in preventive work. But for an early diagnosis campaign three things are essential : (1) an alert medical profession trained in modern methods of diagnosis and treatment of tuberculosis, evenly distributed over the affected areas, (2) suitable public education, which would induce suspected cases to seek medical advice at the earliest opportunity, and (3) the placing of facilities for modern diagnosis and treatment within the reach of people and in areas where the need is greatest.

When we remember that 30 per cent of the patients taken care of at the dispensaries are without employment, any provision that we make for institutional treatment must be largely free or subsidized; otherwise we shall not be able to isolate the infectious cases, which should be the principal aim of all anti-tuberculosis efforts. According to a modest estimate, we have in Bengal approximately 200,000 'open' or infectious cases. To think of isolating even a reasonable fraction of these cases in institutions would be building an Utopia at the present moment.

Where then shall we begin ? The dispensary system must, therefore, form the foundation scheme of any anti-tuberculosis programme as being the most easily operative and the least costly of them. The Tuberculosis Association of Bengal has devoted its efforts to implement this part of the scheme. But we have been immediately confronted with other facts which cannot be ignored. We have found that the dispensaries, which can only take part in domiciliary treatment, case-finding, education and unsatisfactory isolation of cases in the home, find it extremely difficult to take care of cases which should better be placed in preventoria, sanatoria, hospitals or care-colonies. If Bengal possesses 400 dispensaries, according to accepted Western standards, she can arrange for the ambulatory surgical treatment of only 15,000 to 20,000 cases. According to our calculation, Bengal should have 400 dispensaries, sanatorium or hospital accommodation for 30,000 early and moderately advanced cases, isolation hospitals for 40,000 advanced cases, 20,000 seats in care-colonies, 5,000 seats in preventoria and 10,000 beds for glandular and osteo-articular cases. A modest scheme prepared by us some time ago (*vide Calcutta Municipal Gazette*, 9th April, 1938, pp. 29–39) placed the immediate financial requirements of this province at Rs. 22 lakhs for capital and Rs. 2 lakhs for recurring expenditure. How and when can it be made available ?

Happily for us a noble Vicereine of India has taken up the problem and has made a timely appeal on behalf of the suffering population of this country. We shall not probably get the whole of the money that we require, but it will undoubtedly help us to make good progress. Money alone will not solve the problem, unless the Government machinery, the local bodies and the public in general whole-heartedly co-operate with the eradication of the 'white plague'. Though there is a long way ahead and though we have not yet been able to touch even the fringe of the problem, there is no reason to despair. We must remember that 'honest work diligently made never goes unrewarded'. Let us live in this faith and go along cheerfully ministering service to the distressed, until we attain ultimate victory.

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THE SERIOUSNESS OF TUBERCULOSIS IN INDIA AS SHOWN BY A STUDY OF INCIDENCE AND TYPE

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OUR knowledge at present as regards the incidence of tuberculosis in India is very meagre, as there have been few scientific investigations and these very limited in extent. Apart from these few investigations, our main knowledge rests on general observations deduced from dispensary and hospital records and mortality statistics. As regards health in the larger cities, because of the better facilities for collecting statistics there, it is known for certain that tuberculosis is exceedingly prevalent, but what the conditions are in the villages is largely a matter of conjecture. Many detailed surveys will have to be done over large and varied areas before we can get any real idea as to what is the actual state of affairs.

Tuberculin surveys

One of the ways of getting knowledge as to the extent and distribution of tuberculous infection is by tuberculin surveys of many thousands of people in different parts of India and in different communities, under differing conditions, urban and rural.

Ukil (1930) gives figures for a tuberculin survey of 6,500 individuals very predominantly urban, and a jail population, and a positive reaction was found varying from 11 per cent in those of five years and under to 75 per cent in those of 60 years and over. He also shows that the figures for rural areas are much less than for urban and that the positives increase as the conditions approach the urban.

Tuberculin survey of 6,665 *individuals in South India*

A tuberculin survey was carried out by the U. M. T. Sanatorium in parts of the Chittoor District and its environs, 3,015 in 1937 (Benjamin, 1937) and 3,650 in the present year. In these two surveys were included three *taluk* headquarters towns with a population varying from 4,000 to 10,000, two large villages with a population each about 1,000, and a number of small villages with populations varying from 50 to 300. In some of the villages, the whole population was tested. In addition, the survey included four schools in Madanapalle, one in Vayalpad, two in Chittoor, two in Kolar Town in the Mysore State, and an industrial school in Katpadi in North Arcot District.

The test was done without any selection in the towns and villages, for all ages and both sexes. All communities, Hindus, Christians and Muslims, were included. The majority tested were of the poor and middle classes, as these formed the bulk of the population of the areas tested. But a number of well-to-do families was also tested.

In this tuberculin survey, the total number tested was 6,665, composed of Hindus 4,201, Indian Christians 1,668 and Muslims 796.

From these, 163 persons are omitted—Hindus 43, Christians 101 and Muslims 19—as they were coming into personal contact with tuberculous patients in the wards of the sanatorium during their daily work and, as such, were specially exposed to infection and could not be considered as a sample of the normal population.

There is no question of tuberculization of the villages proceeding from the sanatorium, as most of the villages and all the small towns tested were miles away from the sanatorium. It is interesting in this connection to note that 227 persons living in the sanatorium compound, but not attending on patients, showed a percentage of tuberculin positives similar to that seen in the village group.

Technique

The method used for the tuberculin test was that of von Pirquet, according to the modern technique, with a scarification of the skin about half an inch long through tuberculin already applied to the skin, using, of course, the usual aseptic precautions. Readings were generally taken after 48 hours, a few only being after 72 hours, and the intensity of the reaction was noted under different heads. A positive was recorded when there was palpable œdema and redness of a width of more than 2 mm. When the width was from 3–5 mm., it was noted as +; from 6–10 mm. as ++; over 10 mm. as +++. The tuberculin employed was Burroughs, Wellcome & Co., Old Tuberculin, Human (T).

We realize that the Mantoux intra-dermal test is the more sensitive, and has the advantage over the von Pirquet test, that in a particular individual successive tests can be done with graded doses and the results compared. This should be the test used when the group tested is under control, and is amenable to such a test.

In the communities such as those with which we had to deal, it was impossible to use the Mantoux test involving an injection, except in a few educated individuals.

In this connection it is interesting to note that such an eminent tuberculosis worker as Bardswell (1938), in a recent tuberculosis survey in the island of Cyprus, had to abandon even the von Pirquet test, and do Morro's inunction test, because of the difficulty of getting the co-operation of the population. Heimbeck (1938) is of the opinion that the accuracy of the von Pirquet reaction, according to modern technique, is very good, and that the margin of error, when compared to the Mantoux test, is only 1.8 per cent in persons below the age of 15, and only 3 per cent between the ages of 16 and

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30. The von Pirquet test has been variously estimated to be equivalent to 1 in 10,000 dilution used for Mantoux (Dow and Lloyd, 1931), and 1 in 2,000 (Matthews, 1931), and in the African survey reviewed by Cummins (1935) as roughly comparable to the intradermal test with 1 in 5,000 dilution of tuberculin.

Analysis of findings

As a result of this tuberculin survey, we find that the average percentage of positives for the whole group is 37.8 for adults and 10.8 for children under 15 years of age. In small towns, children under 15 years of age showed 11.6 per cent positive and in the villages 8.2 per cent. Adults showed 40.1 per cent in the towns and 30.8 per cent in the villages. This is shown in table I.

TABLE I

Results of a tuberculin survey

Community	Total						Towns						Villages					
	Adults			Children			Adults			Children			Adults			Children		
	Number	Positives	Per cent	Number	Positives	Per cent	Number	Positives	Per cent	Number	Positives	Per cent	Number	Positives	Per cent	Number	Positives	Per cent
Hindus	1,995	730	36.6	2,163	214	9.9	1,401	562	40.1	1,664	183	10.9	594	168	28.3	499	31	6.2
Indian Christians.	701	227	32.4	866	92	10.6	574	192	36.9	647	72	11.1	127	35	27.6	219	20	9.1
Muslims	393	210	53.4	384	64	16.7	332	172	51.8	317	51	16.1	61	38	62.3	67	13	19.4
TOTAL	3,089	1,167	37.8	3,413	370	10.8	2,307	926	40.1	2,628	306	11.6	782	241	30.8	785	64	8.2

When we analyse the total number investigated according to different communities, we find that there is very little difference between the Hindu and Indian Christian groups, but a marked difference is found in the Muslim group, the percentage of positives being much higher in this group than in the two other groups, both in towns and villages, and also among adults and children. Compared with 36.6 per cent and 32.4 per cent positives for Hindus and Christians respectively, Muslims show 53.4 per cent positives for adults, and 16.7 per cent for children, as compared with 9.9 and 10.6 per cent for Hindu and Christian children. While among Hindus and Christians the percentage of tuberculin positives is higher in the towns than in villages, among the Muslims the opposite is found. The *purdah* system and special social habits among the Muslims may increase the chances for tuberculous infection and consequent higher percentage of positives in this community, but why the villages show a higher percentage than towns cannot be explained. As this group comprises only 777 individuals, it is too small a number on which to form any opinion; but it would be interesting to see in further investigations whether this higher percentage in the villages persists, and, if so, what are the special factors contributing to this.

It is of some importance to note the intensity of reaction. In Europe the intensity of reaction is not of such great importance among adults, but among small children an intense reaction is usually associated with active disease. Among Africans, the significance of a tuberculin reaction has been found to be similar to that among children in the European races. Hypersensitiveness to tuberculin is considered a serious matter in Africans and other primitive races, as this hypersensitiveness is not associated with an immunity, but just the opposite, and, therefore, is a danger signal. What the significance of sensitivity to tuberculin means in India, we do not as yet know.

In table II are given the reactions found in the investigation.

It will be seen from this table that 56.4 per cent of the positives were reactors with a reaction between 3 and 5 mm. wide; 31.5 per cent with a reaction of 6 and 10 mm. wide; and 12.1 per cent with a reaction of above 10 mm. wide. If we group the two stronger reactions together, we find that as regards community, Muslims have as many as 61.3 per cent of the strong reactions, whereas Hindus have 40.5 per cent, and Christians 37.6 per cent.

The higher percentage of strongly positive reactions among the Muslims coincides with a higher percentage of infection rate among the same community as shown by tuberculin tests.

It was possible to persuade 69 of those showing strong reactions, and a few with suspicious symptoms, to come to the sanatorium for *x*-ray and other examinations. Of these, seven were found to be suffering from active tuberculosis, five of them with cavities and postive sputum.

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TABLE II

Strength of von Pirquet positive reaction

Community	Number	+	Per cent	++	Per cent	+++	Per cent	++ and +++	Per cent ++ and +++
Hindus ..	944	562	59.5	280	29.7	102	10.8	382	40.5
Christians ..	319	199	62.4	81	25.4	39	12.2	120	37.6
Muslims ..	274	106	38.7	123	44.9	45	16.4	168	61.3
TOTAL ..	1,537	867	56.4	484	31.5	186	12.1	670	43.6

Six of these seven were engaged in their ordinary work.

When we analyse the figures with regard to occupation (table III), we find the highest percentage naturally among those who attend on patients—then come the police, merchants and clerks, and those with in-door occupations. The group with the lowest percentage among adults is those engaged in agriculture. Those whose occupation could not be definitely ascertained and also those where the numbers were less than ten in any single group are all grouped together in the miscellaneous group.

It is evident from the figures given by the above survey that the villages in the area surveyed are no longer free from infection, and are not 'virgin soil' in the formerly accepted sense of the word, and yet this area is comparatively isolated with some of the villages about 25 miles away from rail and main roads, is sparely populated, and has one of the best climates in South India.

TABLE III

Occupations and tuberculin positives

Occupation	Number	Positives	Per cent
Children under five years	465	17	3.6
School children	2,769	409	14.8
Ward boys	29	25	86.2
Ward ayahs	11	9	81.8
Police (constables and inspectors)	41	26	63.4
Clerks	52	31	59.6
Doctors (medical students)	23	13	56.5
Merchants	243	136	55.9
Cooks	53	25	47.2
Sweepers	30	14	46.7
House servants	85	39	45.9
Carpenters, artisans and goldsmiths	141	64	45.4
Tailors	108	49	45.4
Nurses and compounders	66	28	42.4
Hotel-keepers	15	6	40.0
Teachers	151	60	39.7
Peons	53	20	37.7
Housewives	542	184	33.9
Dhobies	44	13	29.6
Coolies	450	130	28.9
Agriculturists	441	116	26.3
Miscellaneous	853	246	28.8
TOTAL ..	6,665	1,660	

THE TYPE OF PULMONARY TUBERCULOSIS

Variation in type in different races

General observations of tuberculosis among European races and a study of their *x*-ray films, and post-mortem examinations, reveal that a comparatively large proportion of these show a tendency to chronic disease with localization, and marked fibrosis round tuberculous foci and cavities, but this state of affairs does not hold good for other races. Investigations done in America among the negroes and in Africa among the native population show an entirely different type of disease. A recent investigation done in Tanganyika (Wilcocks, 1938) shows a preponderance of cases of acute 'galloping consumption' and bilateral disease. Fibrosis is not common, and, when it occurs, does so chiefly in middle-aged people. The lung bases are frequently attacked. Cavitation is frequently seen, but it is rare to see a zone of fibrous tissue round these cavities. Massive consolidation is

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occasionally found, and miliary spread often occurs.

Type of disease found in patients in India

A detailed study has been made of the type of tuberculosis found in 2,158 Indian, Anglo-Indian and European patients admitted to this sanatorium since 1930, all of whom were diagnosed as suffering from pulmonary tuberculosis. With a view to the determination of type, the following points were studied : the amount of fibrosis, evidence of previously healed lesions, tendency to dissemination, the question whether one or both lungs were involved, the amount of cavitation, all as shown in *x*-ray films; the evidence of resistance to the disease as shown by the length of time between onset of symptoms and admission to the sanatorium, the activity of the disease as shown by blood examinations (Schilling count and sedimentation test).

The results are shown in table IV.

TABLE IV

Analysis in percentage of findings in 2,158 *Indian, Anglo-Indian and European patients*

	Indians		Anglo-Indians		Europeans	
	Number 2,021	Percentage	Number 94	Percentage	Number 43	Percentage
Fibrotic	108	5.3	12	12.7	17	39.5
Exudative	1,879	93.0	81	86.2	26	60.5
Pleurisy	34	1.7	1	1.1	..	..
Previously healed lesions ..	321	15.9	30	31.9	19	44.2
Acute-initial, 1 to 24 months ..	1,560	77.2	67	71.3	27	62.8
Chronic-recrudescent	461	22.8	27	28.7	16	37.2
Localized	397	19.6	21	22.3	24	55.8
Moderately disseminated ..	783	38.7	45	47.9	16	37.2
Markedly disseminated ..	841	41.6	28	29.8	3	7.0
Unilateral	581	28.7	20	21.3	18	41.9
Bilateral	1,440	71.3	74	78.7	25	58.1
With cavities	1,482	73.3	61	64.9	21	48.8
Cavities with soft walls ..	1,395	94.1	50	82.0	13	61.9
Cavities with moderately hard walls	87	5.9	11	18.0	8	38.1
With single cavity	704	47.5	32	52.5	14	66.7
With two or three cavities ..	385	26.0	14	23.0	4	19.0
With multiple cavities	393	26.5	15	24.5	3	14.3
Activity of disease shown by Schilling count and sedimentation rate—						
Low	157	9.3	13	16.9	5	17.9
Moderately high	315	18.7	13	16.9	12	42.9
High	1,215	72.0	51	66.2	11	39.2

From this table it will be seen that among the 2,021 Indian patients, only 5.3 per cent showed any evidence of marked fibrosis, while 93 per cent showed a predominantly exudative type of disease. Previously healed lesions, as denoted by calcified spots either in the lung or hilus, were seen in only 15.9 per cent. Only 19.6 per cent showed a tendency to localization, while as many as 41.6 per cent showed marked dissemination. In 71.3 per cent of the patients, both lungs were involved. As regards cavities, 73.3 per cent of the patients showed cavitation, 52.5 per cent of these showing more than one cavity; the walls of the cavities in 94.1 per cent appeared soft, and only 5.9 per cent showed evidence of even moderately hard fibrous walls. As regards resistance to the disease, judged by the duration of symptoms before the patients came to the sanatorium, 77.2 per cent of the patients belonged to the 'acute-initial' group, according to Cummins' classification, that is, with continuous symptoms of less than two years' duration, and only 22.8 per cent to the 'chronic-recrudescent' group, that is, with symptoms lasting more than two years, or with symptoms followed by intervals of good health. As many as 72.0 per cent showed high activity of disease, as judged by the blood.

The Europeans are very few in number, being only 43, but among them the type of disease approximates to what is found among Europeans in the west. In the group 39.5 per cent showed evidence of considerable fibrosis and 44.2 per cent of previously healed lesions; 55.8 per cent showed a tendency to localization of the disease.

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The figures for the 94 Anglo-Indian patients indicate a type of tuberculous disease in the lung between that of the Indians and Europeans.

Another investigation into the distribution of lesions in the lung (table V) shows that as high as between 71.2 and 73.1 per cent. of the patients have lesions in the middle zone of one or both lungs, and 32.6 to 33.6 per cent have lesions in one or both bases. It is recognized that the more chronic type of the disease is found in the apical and sub-apical zones of the lungs, and that lesions in the middle and basal zones are usually of the more acute type.

The results of these investigations show that for Indian patients the disease is of a very serious type; it is acute, rapidly developing with little tendency to show a natural resistance and healing. The allergic condition is such that there is a severe exudative reaction followed by a rapid breaking down of tuberculous tissue with a resultant cavity formation.

TABLE V

Distribution of Lesions in the lungs

	RIGHT LUNG LESIONS				LEFT LUNG LESIONS			
	Apic	Sub-apic	Mid-zone	Base	Apic	Sub-apic	Mid-zone	Base
Number	1,141	1,368	1,438	658	973	1,220	1,478	678
Percentage	56.5	67.7	71.2	32.6	48.1	60.3	73.1	33.6

Conclusions

In the earlier part of this paper a review has been made of a tuberculosis survey in a limited area and of a study of the type of disease found in Indian patients. The survey, of course, is too small and limited to be able to form from it any general conclusions for the whole of India or even for districts or areas outside that surveyed. It does, however, support the general impression that tuberculous infection is widespread even in the villages.

The study of the type of the disease found in Indian patients can perhaps be used for a general conclusion, as the patients included in the study have come from all parts of India, and little difference has been noticed in the type of the disease in patients coming from different parts of the country. It may be concluded that for Indians as a whole tuberculosis is a very serious disease, because of its tendency to show itself in an acute, rapidly developing form. This reveals a general lack of immunity among Indians as a race.

The African investigations, already referred to, show that, as long as the Africans remain undisturbed in their own natural surroundings, tuberculosis does not appear as an epidemic disease, but it spreads comparatively slowly, and there are a large number of relatively mild and chronic forms of the disease with some severe cases. But when once the conditions of life are changed, by, for instance, migration to the mines, the situation becomes quite different, and a great many succumb to a very acute type of the disease.

In India we seem to have a similar situation. There is a widespread incidence of tuberculous infection, as far as can be judged; at the same time the immunity response is very low. Conditions of life in India are rapidly changing. The villages are being rapidly brought into contact with towns and industrial centres through improved means of communication. A liking for the amenities of civilization attracts people from the villages. There are more opportunities for infection in the increased concentration of people for education as well as for industry. The poverty of the villager makes him easily lured to the town in the hope of quickly getting rich there. Life in the city is usually associated with much increased strain both mental and physical. Not only is this true in the city, but it is equally true wherever civilization is making headway, even in the villages.

The changing conditions of life in India to-day, taken in conjunction with wide-spread infection and a low immunity, make tuberculosis an increasingly grave problem.

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DEDUCTIONS FROM EXPERIENCE IN A TUBERCULOSIS EX-PATIENTS' COLONY IN INDIA

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DEVELOPMENT OF AFTER-CARE SCHEMES FOR EX-PATIENTS

IN the earlier stages of the campaign against tuberculosis in the West, emphasis was laid on the treatment of the tuberculous patient, generally in a hospital or sanatorium, and then, when the hospital or sanatorium had done all that it possibly could, the patient was discharged to return to the conditions of living from which he came. Fortunately for many of these patients, the conditions of living and work to which they returned did not upset the favourable results gained during treatment, and these patients were able to remain well, even when they resumed their old or similar ways of life. But there were always a number who could not stand the strain of their old conditions and who broke down and sometimes returned for institutional treatment; others died at home. In addition to those who returned to their ordinary life with either probability or possibility of remaining well, there were discharged year by year a number of patients with a positive sputum in spite of treatment, who were not only a potential source of danger to those among whom they lived, but who had often little hope of being able to maintain the condition of equilibrium obtained by their treatment. The poor ex-patient was more likely to break down than the more well-to-do.

Macnalty (1932) writes 'The patient in a good economic position can, upon his discharge from a sanatorium, live the carefully regulated life prescribed under satisfactory conditions with a good prospect of the benefit he has received from sanatorium treatment being consolidated. The patient less favourably circumstanced, on the other hand, returns only too frequently to the full stress of life, to unsatisfactory conditions of living, and finds it impossible unaided to carry out the directions he has received. It is the common experience that patients so situated not infrequently relapse'.

It is now more and more being recognized that the ultimate results of treatment to a great extent depend on the after-care of patients, and without this after-care much of the expenditure of skill, time, and money in treatment is wasted.

Many patients can, however, return to their normal lives with every prospect of keeping well. Sandiland (1937), although it is not known in what stage of the disease were the patients to whom he refers, considers that 50 per cent of patients could return to their former employment or some modified form of it, while 15 per cent will remain chronic invalids and the remaining 35 per cent need some form of after-care schemes, as they will be unable to compete with healthy men in their former employment.

In India, follow-up figures for ex-patients are not very numerous. But Frimodt-Möller (1937) finds that of 1,695 patients whom he has been able to trace out of 2,604 patients treated in the U. M. T. Sanatorium at Arogyavaram, Madanapalle, 898 or 53.0 per cent were alive five years after leaving the sanatorium and 819 or 48.3 per cent were doing full work. If we omit those who were discharged with no improvement as a result of treatment, namely 434, we find that of the remainder, 1,261 (*i.e.*, those who have gained improvement) or 64.4 per cent were doing full work five years after leaving the sanatorium. The three stages were approximately equal in number, namely, 430, 429 and 402 for stages I, II and III, with 88.4, 73.9, 45.2 per cent respectively alive and working five years after discharge. These figures prove at any rate that a large proportion of patients who leave the sanatorium, having gained improvement, on returning home can remain well and do full work under the ordinary conditions to which they have been accustomed. On the other hand, 35.6 per cent were unable to keep up the improvement that they obtained while under treatment in the sanatorium and died of their tuberculosis within five years.

It is in the effort to help this class of patient that various after-care schemes, such as colonies, village settlements and workshops have been brought into being. But as Brieger (1937) says in summarizing a survey of various schemes 'This historical retrospect intensifies the impression that "the road of after-care is strewn with combatants and dreamers, with the disillusioned and shipwrecked". The problems were recognized, but the underlying principles were not stated and the methods by which a solution was attempted were inadequate'. Again, speaking of the establishment of separate after-care institutions, he writes :—'The organization of treatment and after-care in distinct units, each of which was intended for the fulfilment of one object only, is a system which has not shown itself capable of development and has not been equal to the problems set by the rehabilitation of the tuberculous persons. . . . An attempt to create independent establishments for separate problems of after-care broke the continuity of treatment. . . . On principle, an after-care establishment is justified only if it grows of necessity out of a sanatorium'.

AFTER-CARE FOR EX-PATIENTS AT U. M. T. SANATORIUM

(a) *Ex-patients on staff of the sanatorium*

Early in the history of the U. M. T. Sanatorium, Arogyavaram, a request came from some

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of the patients themselves for some kind of work in or about the sanatorium by which they could become economically independent in the security given by those who knew their medical condition. This was mainly from those who were discharged as 'much improved' and whose disease was not completely 'arrested'. As has been done in many parts of the world, the sanatorium has attempted to provide for a number of such ex-patients by finding them employment on the staff of the institution. Since the beginning of the sanatorium in 1915, but mainly since 1920, work, either temporary or permanent, has been found in this way for 20 men and 19 women, as nurses or nursing orderlies, clerks, store-keepers, *x*-ray and laboratory orderlies, teachers, motor driver, doctor, pathologist, peons; a few have taken a special six months' course of training in laboratory work and have afterwards gone to other hospitals. But the number of ex-patients which a sanatorium can take on its staff is limited, partly by the number needed on the staff, partly by the number it can afford to take, partly by the technical nature of much of the work and partly by the need of having a fair proportion of its staff who are physically strong. In this last connection it must be stated, however, that a number of the ex-patients taken on the staff have after a few months' work proved that they are quite capable of doing full-time work, without any fear of a break-down.

(*b*) *The ex-patients' colony*

There were soon found to be a large number of patients who needed some kind of after-care but who could not be taken on the staff of the sanatorium either for the reasons stated above or because they could not, for physical reasons, undertake the kind of work required in the sanatorium, or else they were not educationally or culturally equipped for such work. Yet these kinds of patients also begged to be provided with any kind of work by which they could live and be close to medical help. The result was that in 1920 a small ex-patients' colony section was begun privately, which included at first silkworm rearing, silk spinning and weaving, and cotton weaving. Later, the need was felt for further kinds of work, specially as the output of hand-woven products that could be sold was limited. In 1930 the colony became a separate entity and was registered under Act XXI of 1860. A site of about 9½ acres adjoining the sanatorium was purchased by money raised among and through the staff of the sanatorium. The site purchased included some village houses, wells, and a fruit garden. The weaving section was removed to this new site.

The colony was registered as a separate body mainly for financial reasons peculiar to the sanatorium, but such a separate registration may not be necessary for all such institutions. Although the colony is an independent unit, it is organically bound to the sanatorium through the governing body of the colony; the majority of the governing body are by constitution leading members of the staff of the sanatorium and the other three of the governing body have also been members of the staff of the sanatorium, including two ex-patients. The result is that the whole policy of the colony is directed by those who have an intimate knowledge of the problems of tuberculosis and of the needs and abilities of ex-patients.

The colony has been slow in its growth, largely because of the difficulty of getting money for its expansion. It has been impossible to take in a great many who applied for admission and who really needed colony treatment. At present there is accommodation for eleven ex-patients and two of them are married men with their wives living with them, and one of them has three children, two born in the colony. The activities of the colony have gradually expanded, and besides silkworm rearing, and silk and cotton weaving, there have been carried on vegetable and fruit gardening, poultry and cow-keeping, printing with a very small hand-press, tailoring, various small crafts, such as palm-leaf weaving, papier-mâché work, and experiments in fruit-syrup and soap making; in addition, a general store has been developed which began with an ex-patient with one coolie carrying about merchandise in a basket, and which has now developed into a proper shop with a turn-over of about Rs. 2,000 a month and employing 5 ex-patients.

Altogether 37 ex-patients have been taken into the colony for shorter or longer periods.

TYPE OF EX-PATIENTS ADMITTED TO COLONY OR EMPLOYED BY THE SANATORIUM

It is of interest to see what kind of ex-patients have been admitted to the colony or have been employed on the sanatorium staff. The following table shows the stages (Turban Gerhardt) in which the patients originally were admitted to the sanatorium and the results of treatment on discharge, and also whether their sputum was tubercle-positive or negative on admission and discharge. The figures include 57 men and 19 women, in all 76. They include 68 Indians, 7 Anglo-Indians and 1 European; 2 patients treated in other sanatoria, about whom records are incomplete, were also employed.

It will be seen that the majority of the ex-patients were in stage III, 43 out of 76, and of the whole number only 14 or 18.7 per cent were discharged as 'arrested'. As regards sputum, 57 or 75 per cent were positive for tubercle bacilli on admission, and 19 or 25 per cent were still positive on discharge.

The majority of patients afterwards admitted either to the colony or taken on to the sanatorium staff had had to have a long period of treatment and did not show a quick response. The average length of treatment for the 76 patients was 497 days, being 192 for those in

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TABLE I

Stage	Number of ex-patients	Discharge results			Sputum on admission and discharge		
		Arrested	Much improved	Improved	+ and +	+ and −	− and −
I	8	6	2	..	1	1	6
II	22	8	12	2	3	9	10
III	43	..	31	12	15	28	..
Treated elsewhere and records incomplete.	2	..	..	..	..	..	..
Non-pulmonary (hip).	1	..	..	..	..	..	1
TOTAL	76	..	..	..	19	38	17

TABLE II

Stage	Number of patients	Known living and working	Known deaths from tuberculosis						Unknown
			Arrested	Much improved	Improved	Sputum ++	+ ÷	−−	
I	8	8	..	..	..	..	..	..	..
II	22	17	..	1	(1)	..	1	..	3
III	43	26	..	8 + (2)	5	9	4 + (1) + (2)	..	2
Treated elsewhere.	2	2	..	..	..	..	..	..	..
Non-pulmonary.	1	1	..	..	..	..	..	..	..
TOTAL	76	54	..	9 + (2)	5 + (1)	9	5	..	5

+ (1), + (2) = Deaths from other causes.

stage I, 378 for those in stage II and 625 for those in stage III.

No women have been admitted to the ex-patients' colony as conditions in India make it more difficult for a colony for women than for men. Of the stage I patients only 2 were admitted to the colony, the rest being connected with the sanatorium staff.

At the present time there are 22 ex-patients in the colony and on the sanatorium staff. Some of the ex-patients have stayed on a few months, others have been as long as 23 years.

The after-history, *i.e.*, the history after discharge from treatment in the sanatorium, is known for all except 5 of the ex-patients, and it covers those who have been away from treatment from six months to twenty-three years.

It will be seen that 54 or 71.1 per cent are known to be alive and working; 14 or 18.7 per cent have died of pulmonary tuberculosis, and 3 are known to have died of non-tuberculous disease—typhoid, pneumococcal pneumonia and heart disease. Of the 19 discharged with a positive sputum, 9 have since died.

The period for which those who died were alive after their original discharge from the sanatorium varied from one year and eight months to nine years, except for an orphan boy admitted temporarily to the colony who lived only nine months; the average length of life after original discharge of those who died was nearly five years. Of those who died from pulmonary tuberculosis, 7 were in the colony and 7 on the sanatorium staff, and 5 of them died some considerable time after they had ceased to be connected with either colony or sanatorium. It is most improbable that the majority of these ex-patients could have lived so long had they not been in the colony or on the sanatorium staff.

DEDUCTIONS FROM EXPERIENCE WITH THE COLONY

(a) *Finance*

The financing of an ex-patients' colony depends, of course, on the size of the scheme. But there are certain points which we may quote from our own experience, and a few figures are given to show that a beginning of a colony may be made at a very low cost. A sum of Rs. 2,250 was spent on the site purchased, which included several village houses, a garden, and three wells. The village houses already there were utilized, but made fit for ex-patients to live in by

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removing parts of the walls and substituting wire frames, and by putting in stone or cement floors. Other simple, partly open, thatched houses with good floors were built, each costing about Rs. 130. This type of house has been found quite suitable for the purpose, and, in addition to the advantage of cheapness, has the advantage that those who come from villages, if they go back to their villages later, learn that they can live under village conditions and keep well. This is of special importance, as our experience shows that those who value a colony life are mainly those who come from such or similar conditions.

Up to now the capital expenditure on industries has not been very large. The printing was begun with a small Adana press costing, with some accessories, Rs. 60 to Rs. 70. The building used was a small village house with a flat stone and clay roof. This small press has been working for eight years with little additional expenditure, except on more types, and has been able to do a great deal of the small printing required by the sanatorium, in addition to some outside orders.

The weaving shed is a semi-open building with a good roof and a good floor, and houses several looms. The looms were purchased second-hand; these and the building cost about Rs. 800, and since then there has been practically no capital expense. The weaving has supported between 2 and 5 ex-patients.

For a very little expenditure, such as the above, a means of earning a livelihood may be provided for one or more ex-patients. On the other hand, while industries have up to now been on a very small scale, partly for financial reasons, partly because the whole scheme was in the nature of an experiment, there is no reason why in the future we may not look forward to the development of larger industries involving larger capital expenditure. In fact, it will only be possible to develop the colony by having larger industries.

All capital expenditure has had to come from donations. It is not possible to raise money for capital expenditure from the earnings of the ex-patients. This has been found to be the handicap in Europe, and we believe it to be true for India too. To a large extent the labour of ex-patients is sub-standard labour, and in general they need a higher standard of living, as regards food, than the ordinary healthy villager, and hours of labour have to be shorter. This means in most cases a higher rate of salary than would be paid under similar conditions and for similar work in a village. But we have found that it is possible to make the colony self-supporting as regards ordinary maintenance. This, besides being desirable, seems to be necessary to achieve in India, as it is unlikely that for a great many years to come there will be public schemes for support of the tuberculous and their families. Only a few of the western projects for helping ex-patients are self-supporting, and the deficit is made up in many by subsidies to individuals from sources such as municipalities, district boards, county councils, health insurance. But such sources are absent in India, and therefore, colony schemes or similar schemes will largely have to depend on their own resources.

Another point to bear in mind is that any capital raised for the starting of a colony or industries connected with tuberculous ex-patients will have to be a gift to the cause of helping such people. If the industries started can be made to pay their way, it will be good, but it will be asking what is impossible to require any kind of interest or dividends to be paid on capital invested.

(*b*) *Relation to sanatorium*

There has been considerable discussion as to whether a colony should be located away from a sanatorium or attached to a sanatorium. We are convinced that to be a success a colony must be in close relation to a sanatorium; whether technically part of the one institution or not, is not of great importance. There are two great principles behind a colony, namely, medical security and work which gives financial security for the colonists.

Medical security is obtained partly by medical control of the whole colony, partly by the presence of skilled medical aid when such is necessary. The work of the ex-patients, specially in the earlier part of their lives in the colony, has to be carefully controlled from a medical point of view. The beginning of life in the colony is a test of the stability which it is thought has been gained in treatment in the sanatorium. There should, therefore, be a possibility of easily transferring a patient temporarily back to the sanatorium, if the stability required has not been obtained.

Moreover, the selection of patients to go on to the colony must be made by those who have been looking after the patients and will continue to look after them. Others cannot make this selection. For example, we admitted one to the colony from outside who had a medical certificate from a tuberculosis officer that he was quite fit for a colony and he arrived with an intestinal tuberculosis for which he needed hospital or sanatorium treatment.

Temporary transfer back to the sanatorium has been necessary in a number of our patients; for example, two of the ex-patients had severe hæmoptysis and temporarily returned to the sanatorium; one had a small hæmoptysis, but after careful examination it was decided to be unnecessary to transfer him back to the sanatorium, and after some days of rest he returned to work and has remained well. Two of the ex-patients had to return to the sanatorium, because of a relapse, and had a phrenico-exairesis operation, after which they were able to return to the colony and have since remained well. Six

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ex-patients returned to the sanatorium after being from a few months to several years in the colony, and did not return to it, four of them dying in the sanatorium and two not being suitable for return to the colony. The confidence of the ex-patient in the nearness of medical help, which is one of the reasons why he wants to live in a colony, is only obtained if those who have treated him in the past are there to help, if need arise in the future.

On the other hand, while there is medical control of the colony and skilled medical aid is available if required, there should be as little institutional atmosphere about the colony as possible, and as much freedom as possible should be allowed.

(c) Selection of the ex-patient for the colony

An important part of the success of a colony lies in the selection of the right type of patient. Not all ex-patients need a colony life; at the same time not all those who need it are suited for it. Various estimates have been made in England as to the number of ex-patients suited, varying between 10 and 30 per cent.

Very few stage I patients need a colony life after treatment. Only two of those admitted to the colony were in stage I. One had positive sputum on admission and negative on discharge; he tried to live at home several times, but each time went down in health; he has remained well in the colony for several years. The other was a weaver who temporarily went into the weaving section, but could not settle down and returned home after a few months.

Those who most need a colony life are those whose disease has not been 'arrested', especially those in stage III and those who are discharged with a positive sputum. These form the majority of those admitted to our colony. Several have had artificial pneumothorax treatment; one had had spontaneous pneumothorax with empyema.

Only patients who have gained a prospect of stability through treatment should be admitted to the colony. For example, those who cannot stand graduated exercise of more than two furlongs are not suitable for the colony. They still need sanatorium treatment.

Another point is that only those who have had a considerable period of treatment in hospital or sanatorium should be admitted to a colony, because only such persons have learnt their limitations and the necessity of a regulated life to be able to take advantage of the conditions of a colony and remain well. Papworth, the most successful of all colony schemes, requires that a patient must have had at least six months' treatment in hospital or sanatorium, before he can be admitted to the village section. The average length of treatment of those admitted to our colony was 463 days. Three out of the four who were under treatment less than four months could not settle in the colony; the other was asked to leave as it was not necessary for him to stay.

Certain people who really need a colony life are temperamentally not suited for it. This we have found to be true of several of our ex-patients who stayed for a time in the colony. One who had sufficient private means to be able to live without work and so did not need the income from his work in the colony, could not settle down. Three Anglo-Indians were unable to settle, possibly because the kind of life and society available in the colony was not what they had been accustomed to.

All ex-patients who are admitted to the colony need not stay on for life. A period of some months or years may prove that they have become quite stabilized, and, if conditions at home are suitable, they may then be able to return home and keep quite well. Of 20 ex-patients who have left the colony to go home, after being in the colony for a period varying from some months to several years, 14 are known to be keeping quite well; 3 have died and 3 are unknown.

This sending of patients home from a colony, if there is a possibility of their remaining well outside, will become increasingly possible if and when more tuberculosis clinics are established with good after-care committees. But a nucleus of skilled workers must be retained in the colony even if they are fit to leave, as they are needed for maintaining the industries and training the unskilled.

(d) The industries in the colony

One of the fundamental principles of a colony is that those who live there should work, the aim being that through their work they should become economically independent and have the mental satisfaction of being again able to earn their own living.

The choice of industries is limited by certain factors. They must be those that ex-patients are physically able to do; they should be those for the output of which a market can be found; they should preferably be industries which employ a fair proportion of unskilled labour; they should be those which can hope to be self-supporting; they should be those which give mental satisfaction to the workers and encourage self-respect.

Although gardening is one of our sections, we have found that in the climate of South India, the heavier work of gardening, such as digging, is too difficult for ex-patients. But there are many things in a garden of some size which can be done by ex-patients, even if the heavy work is done by coolie labour; seed-sowing, planting out of seedlings, collecting of fruit and vegetables and preparing them for the market, can all be done by ex-patients.

Papworth has found a solution for the heavier type of work by the introduction of machinery wherever possible. This has involved a heavy outlay of capital amounting to lakhs of rupees.

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It will be a considerable time before it will be possible to invest a capital of this size in an industry for ex-patients in India, where there is no hope for a dividend. But, in the meantime, much could be done by a judicious use of coolie labour for the heavy part of the work, with ex-patients doing all the direction and the lighter parts of the work.

A beginning can be made with industries for which there is a local demand. A sanatorium of any size has a demand for fruit and vegetables, eggs and milk, printed matter, cotton goods, etc., and it is possible for the colony to undertake the supply of some of these. We began with weaving, especially as there were required by the sanatorium certain kinds of weaving which were done on hand-looms. A certain amount of small printing is required by a sanatorium and can easily be done in a colony. We started with a small hand-press, but, if capital becomes available, a larger press will be bought so that eventually all types of printing may be done. As very little pasturage is available locally, it is not possible for us to do much dairy farming, but in some places this would be very suitable for ex-patients.

Of course, wherever possible, wider markets should be sought and canvassed so that the industries may expand.

Unless the colony has a wide range of industries, it is not often possible to employ an ex-patient in his own trade. Our experience, when we ask what our ex-patients can do, is that they say 'I can do anything'. This amounts to unskilled labour and, therefore, the industries should be chosen which need a fair amount of unskilled or comparatively unskilled labour. One of the difficulties which we have felt is that up till now we have not had enough outlet for unskilled labour.

It should go without saying that the industries chosen should have the hope of being self-supporting. We have had our failures in this respect as we have been feeling our way towards development. We found that under the local conditions we could not make a silk industry pay. We also found that we could not make poultry farming pay; feeding materials are comparatively dear here, disease was common, thefts were common, and the local egg price was 5 annas or less a dozen, and local people did not see why they should pay more for colony eggs, even if they were a little larger and from 'scientifically' fed hens.

Other industries or crafts which we have had in mind as suitable have had to be given up, as materials were not available locally, and the cost of importing them would make production costs too high.

To be mentally and emotionally satisfying and to induce self-respect, industries should be chosen which can compete in the open market and for which there is a demand. Ultimately a colony will fail if it depends on an output which is bought for sentimental and charitable reasons. This applies to some of the handicrafts. We have tried several, but have given them up. Of course, there are handicrafts which can be carried out, and if the work is of the right standard, its appeal will be on its artistic or practical merits, and not on the fact that it was made by ex-patients and is bought 'to help the poor ex-patients'.

In India, in all our industries, we are up against the problem of keen competition, amounting to the competition of sweated labour. In England, ex-patients' colonies were attacked by the trade unions, but those in charge of colonies paid trade-union wages and on this the ex-patients were able to live. In India, we suffer from the lack of trade unions and a general low standard of living. An ex-patient requires a higher standard of living if he is to remain well.

In the things which do not require much capital, there is the difficulty of competition. We started certain types of cultivation; after a year or two the villager saw it was a good thing and he began and undercut us. Some of our weaving was undercut by schools which included no labour costs in their sale prices, as their work was done by schoolboys. In our shop we are up against competition also and our ex-patients cannot work the long hours of the outside shopkeepers; in spite of this, however, we are able to hold our own. In these ways we find difficulties in our industries; some of our experiments have had to be abandoned, and some have stood the test of time and have developed, and we hope to develop them further.

CONCLUSION

A review has been made of an experiment with an ex-patients' colony for the last eighteen years. Even now it is only small, but we are not sorry in many ways that it has not had a very rapid growth, because we have been learning, specially since its reorganization in 1930, and we believe in the principle of slow growth on the right foundations. Some of the greatest failures in schemes for ex-patients have been those which have begun in the grandest way. One of these is Clairvivre in France for which a capital of 52,000,000 francs was voted by the state. A wonderful town was built for ex-patients and after very few years there were left only a few living in it. The causes for its failure were said to be several, but Brieger (1937) says that 'ultimately it resolves itself into a gigantic housing scheme . . . with the medical side in an entirely rudimentary condition', and it was based on the principle that those who should go to live there should depend on their disability pensions.

'Tuberculous families will take advantage of the amenities of a settlement, if by so doing they are materially and psychologically better provided for (*i.e.*, than they would be outside the colony). Thus, these settlers, in such a community, must build up industries to enable

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TUBERCULOSIS IN THE ZENANA

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WE in India are not yet living in a world of known facts, so far as tuberculosis is concerned, so we need to collect and pool all our findings, so that we can the better appreciate our problem and organize our forces to combat it. In Ludhiana for the past seven years we have been studying this disease, and working on an efficient anti-tuberculosis programme.

More and more the zenana looms as the gravest source of infection and the most tuberculosis ridden. We are persuaded that the key to the whole fight lies in the zenana, for without the intelligent co-operation of the women in the home, we can accomplish but little. This becomes very apparent from the fact that over 590,000 of the 600,000 annual deaths from tuberculosis in India occur in the home, for there are less than 3,000 beds for the tuberculous in all sanatoria and general hospitals combined. Until we can take this citadel in which the 'Captain of the Men of Death' holds sway, then and then only will we begin to gain the victory.

The advice has been well given that 'He who has no facts based upon figures should not speak until they are available'. It is true that without figures, man is lost in this world. This article is a study of the statistics and social aspects which we have found in Ludhiana; and which may account largely for the very grave tuberculosis situation that exists among India's womanhood. For comparison and help in evaluating various factors, certain figures and findings are given from an exhaustive study of mortality among young women, by Edna E. Nicholson, in Detroit, Michigan, U. S. A., the home of the Ford motor car.

(*Continued from previous page*)

them to make a living, and these industries can only be built up if a natural selection among the settlers takes place, and this is possible only on the principles which have been put into practice at Papworth'. It is on similar principles that partly from our own experience, partly from the experience of others, we are trying to work. At the root of it all is the ex-patient, unfitted for competition in the outside world, craving for security in life for himself and his family, security in work and security in medical attention.

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GENERAL FACTORS

Population

The total population of Ludhiana, according to the last census (1931), was 68,586. This is distributed among the various community and sex groups as shown in table I.

The particular thing of note in connection with tuberculosis in the zenana is that 58.33 per cent of the total population are male, while only 41.6 per cent are female, an excess of male over female of 16.7 per cent. This proportion is about twice as high as for the Punjab as a whole, which is 8 per cent; Detroit's is 4.8 per cent.

Tuberculosis mortality statistics

During the past eight years, excluding 1935, 1,224 deaths due to pulmonary tuberculosis have been reported to the Municipal Health Officer, an annual average of 175 deaths. Table II gives these statistics, according to age, sex and community. This table is not given as a complete statement of the tuberculosis mortality in Ludhiana, for accurate figures for this are not available, but for the sake of comparing the various age and sex groups in the different communities, we believe it to be a reliable source of information.

The actual death rate can only be estimated by various factors. During 1936, the municipality employed a doctor to verify all deaths. He certified that, in his opinion, 28 additional deaths were due to tuberculosis. This added 21 per cent to the deaths reported as such in that particular year, which percentage, if added to table II, would give the more accurate yearly average of 212 instead of 175, or a death rate of 308.4 instead of 254.9 per 100,000.

This table shows that, of the total number of tuberculosis deaths, 65.6 per cent were female and only 34.4 per cent were male. This contrasts strangely with the general population percentages of only 41.6 per cent female and 58.3 per cent male. This is shown graphically below.

Thirty-four per cent of all tuberculosis deaths occurred between the ages of 15 and 24 : of these, 73.5 were women and only 26.5 were men. In Detroit 23 per cent of all tuberculosis deaths occur in this age period : of which 64.8 per cent were women and 35.2 per cent were men. These figures are higher than for any other age period. This shows that there are one or more common causative factors for the high mortality of young women among the Hindus and Mohammedans in Ludhiana and in Detroit. This also indicates that the tuberculosis problem is centred in this age and sex group and that special effort should be given for its prevention and treatment among young women.

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TABLE I

Population of the town of Ludhiana, 1931

Community	Population			Proportion of males and females per 1,000 of the population of the community		Excess of males over females per 1,000 of the population of the community
	Male	Female	Total	Male	Female	
Mohammedans ..	24,704	18,277	42,981	575	425	150
Hindus (including Jains) ..	12,372	8,336	20,708	597	403	194
Sikhs	2,321	1,124	3,445	674	326	348
Christians	386	663	1,049	368	632	264 (females)
Others	249	154	403	618	382	236
All communities	40,032	28,554	68,586	584	416	168
Detroit	821,920	746,742	1,568,662	524	476	48

TABLE II

Deaths from tuberculosis by age, sex and community, Ludhiana, for seven years

Community, sex	Age										
	0–5	5–9	10–14	15–19	20–24	25–29	30–39	40–49	50–59	60 up	Total
Mohammedan—											
Male ..	20	8	12	25	46	31	52	41	32	33	300
Female ..	16	11	57	93	106	74	85	50	18	16	526
Both ..	36	19	69	118	152	105	137	91	50	49	826
Hindu—											
Male ..	8	4	11	15	20	6	23	11	3	7	108
Female ..	7	5	11	38	50	27	41	23	12	6	220
Both ..	15	9	22	53	70	33	64	34	15	13	328
Sikh—											
Male ..	1	0	0	0	3	1	0	1	0	0	6
Female ..	1	2	0	1	6	9	7	2	2	3	33
Both ..	2	2	0	1	9	10	7	3	2	3	39
Christian—											
Male ..	1	0	0	0	0	0	2	0	0	0	3
Female ..	2	0	0	6	2	2	2	1	0	1	16
Both ..	3	0	0	6	2	2	4	1	0	1	19
'Other'—											
Male ..	0	0	0	0	1	0	0	1	0	0	2
Female ..	1	1	1	3	1	0	2	1	0	0	10
Both ..	1	1	1	3	2	0	2	2	0	0	12
Totals—											
Male ..	30	12	23	40	70	38	77	54	37	40	421
Female ..	27	19	69	141	165	112	137	77	30	26	803
Both ..	57	31	92	181	235	150	214	131	67	66	1,224

Age, sex and community distribution

For the evaluation of the influence of age, sex and community upon the tuberculosis mortality, only the Mohammedan and Hindu statistics are used. A greater percentage of the Sikh industrial workers leave their families in the village, and the presence of over 250 young women in the Women's Christian Medical College and hospital vitiates the Christian tuberculosis statistics. We do not have available the population according to age, so a true death rate (deaths per 100,000 of the specific age group) cannot be calculated. The death ratios given here are figured per 100,000 of the general sex and community population. The actual death rates would be many times higher than these ratios as the death rates are calculated on but a fraction of the total population of each

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sex and community group. These ratios are graphically illustrated in the charts. The corresponding table is also given below.

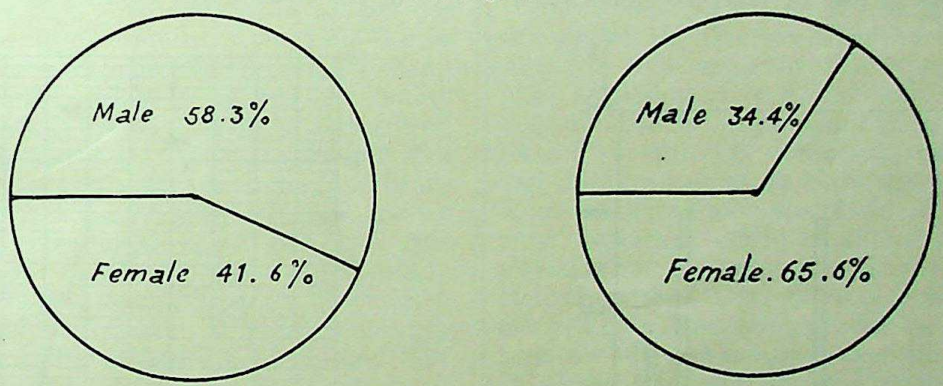
between 50 and 60 years. However, the Mohammedan women ratio rises more rapidly, being 44.46 as against the Hindu of 18.81 for the

TABLE III

Death ratios by age and sex in Mohammedan and Hindu communities (per 100,000 of the general sex and community population)

Age	Mohammedan		Hindu		Total	
	Male	Female	Male	Female	Male	Female
0–4 ..	11.0	12.48	9.23	11.97	10.11	12.23
5–9 ..	4.62	8.58	4.62	8.55	4.62	8.56
10–14 ..	6.88	44.46	12.70	18.81	9.76	31.64
15–19 ..	14.45	72.54	17.31	64.98	15.88	68.76
20–24 ..	26.59	82.68	23.08	85.50	24.84	84.09
25–29 ..	17.92	57.72	6.92	67.17	12.42	62.44
30–39 ..	30.0	66.38	26.54	70.11	28.27	68.25
40–49 ..	23.7	39.05	12.7	39.33	18.2	39.19
50–59 ..	18.5	14.6	3.46	20.52	10.98	17.29
60 up ..	19.17	12.49	8.08	10.26	13.63	11.38
TOTALS ..	172.83	410.44	124.64	397.20	148.73	403.82
	291.63		260.92		276.27	

Text-figure.



General population. Tuberculosis deaths.

An examination of specific ratios shows that the peak of total tuberculosis mortality falls among young people between the ages of 20 and 25. When sex is taken into consideration, it is evident that the greatest mortality among females, 84.09 per 100,000 of the sex and community group, occurs in this same age group, but that the peak of male mortality, 28.27, is not reached until the age period 30 to 40. The female mortality ratio exceeds the male for all age groups with the single exception of Mohammedan men over 50 years of age. The female mortality ratio is 403.8, that of the male is 148.7—a difference of 255.1—over 2.7 times greater among the women than among the men for all ages and both communities.

According to community, there is a great similarity between the Mohammedan and Hindu. The highest ratio is for Hindu young women aged 20 to 25 years, the lowest for Hindu men

10–14 age group, and the total ratio for Mohammedan women exceeds that for Hindu women by 13.2.

Home environment

Since environment has a great influence upon the individual's susceptibility and especially upon the development of active disease, the home is to be regarded as a centre of great importance in any study of this kind. In Ludhiana the home of each tuberculosis death is visited by one of our three public health visitors who notes the conditions, gives advice regarding disinfection, diet, etc., and she also gets as many contacts as possible examined in our tuberculosis clinic or by one of our assistant doctors, on her weekly home visits with the public health visitor. The home is also revisited periodically, in order to find early cases that may develop. Tabulation of the findings of our senior public

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health visitor for 100 tuberculosis-infected families taken consecutively from the list of such families is as follows:—

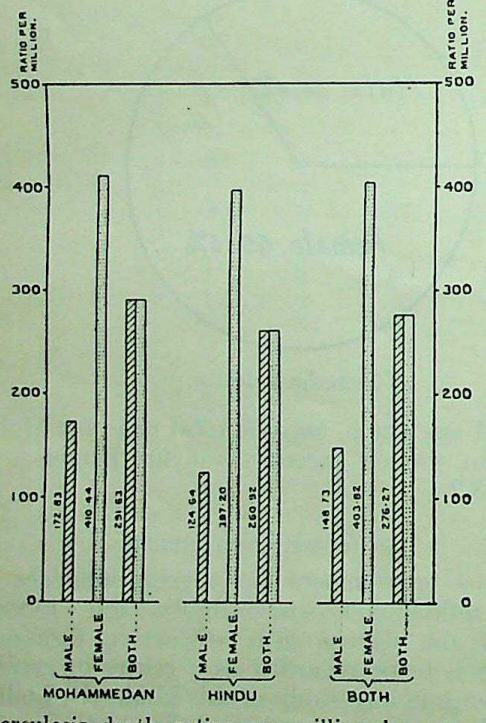
room is the upper limit of satisfactory conditions); (2) poor ventilation indicating improperly constructed houses; and (3) poor state

TABLE IV

Home environment in 100 *families*

Conditions noted	MOHAMMEDAN 50 families	HINDU 50 families	BOTH 100 families
Average number of living members per family ..	4.4	5.3	4.9
Average number of rooms per family	2.3	2.3	2.3
Average number of persons per room	2	2.36	2.18
Number of families with previous T. B. deaths ..	29	25	54 per cent
State of cleanliness—			
Poor	34	34	68 „
Fair	5	6	11 „
Good	11	10	21 „
Ventilation—			
Poor	35	38	73 „
Fair	3	4	7 „
Good	12	8	20 „
Homes disinfected after death of patients	8	11	19 „

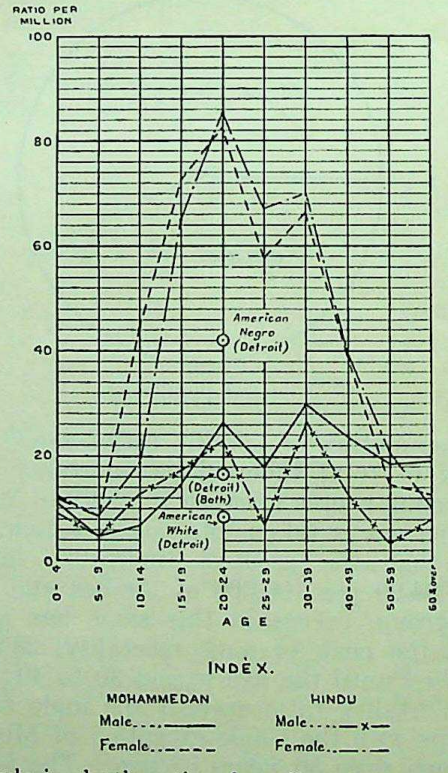
The point of greatest significance in this table, and in fact in this whole article, is that 54 per cent of all these tuberculous homes had suffered the loss of one or more members from



Tuberculosis death ratios per million by sex and communities in Ludhiana (seven-year average).

the same disease, before the death of the present members; 22 per cent had suffered multiple losses : one family had lost 6, another 5, another patient was the last of his family, all having died of tuberculosis. Poor hygienic conditions existed in over two-thirds of all homes, as indicated by (1) over-crowding (1.5 persons per

of cleanliness showing ignorance or carelessness regarding the primary laws of health. Although disinfection is done free, not one in five of the houses was disinfected.



Tuberculosis death ratios for all ages per million of the community and sex population in Ludhiana (seven-year average).

The Detroit conclusions regarding housing conditions are as follows: 'Wherever there are open cases of tuberculosis, it is reasonable to expect that crowded living quarters will increase the amount of disease by intensifying and

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multiplying the contact. However, in the absence of an open source of infection there is little indication that housing, in itself, exerts any direct influence upon mortality, bad as it may be from moral and æsthetic viewpoints'. This emphasizes the importance of segregation of the tuberculous member, especially from the crowded, dirty, dark houses of the majority of the poor.

Personal factors

There are not much data on the social status of the victims. Among our tuberculosis clinic patients are included high officials' sons and daughters, college students, and those with much of this world's goods, as well as the poorest of the poor.

Diet

In her recent article on 'Nutrition and Diet in Northern India', Dr. Dagmar Curjel Wilson concludes that 'the diets studied and the condition of those consuming them are by no means unsatisfactory'. However, one-fourth of the Mohammedan and one-sixth of the Hindu school children she examined were below the normal standard of nutrition, though this was not great. Four annas per day per head was given as adequate for food. The great majority of our clinic patients must live on Rs. 15 or less per month for the whole family, averaging 5.9 in these statistics before the death of the patient. Rs. 15 per month gives each member of a family of 5 only 1.6 annas per day for all expenses, rent, clothing, food, medicines, etc. The Punjab diet is considered one of the best in India, and hence its quality is not responsible for the greater prevalence of tuberculosis here. But it is deficient in quantity in too many homes, especially in the tuberculosis-infected homes. The women again probably suffer more of this deficiency than the men of the household. It is said that the Hindu family is apt to spend a smaller proportion of its income on food than the Mohammedan family with the same income. When it is possible, 4 annas per head per day should be spent on food, to economize on this is truly false economy.

Pardah

The evil effects of the *pardah* system are very much accentuated by tuberculosis invasion of the home. If the infection is present, either known or unrecognized, in these dirty, ill-ventilated, over-crowded homes (65 per cent of our study were so classified), the wonder is that all girls do not succumb soon after being thus imprisoned with this terrible foe. Practically 100 per cent of guinea-pigs succumb when confined with a tuberculous member of their community. It is amply proved that it is the massive and repeated dosages of bacilli which are responsible for most cases of disease. The earlier seclusion, including the *burqa*, of the Mohammedan girl shows its effect in the earlier rise of her tuberculosis death ratio, to 44.46 in the 10 to 14 age group as against her Hindu sister's to 18.81. Their brothers' rises were slight: to only 6.88 for the Mohammedan youth and to 12.70 for the Hindu. A few years later, during the universally critical period of child-bearing, practically all members of these *pardah* families get the full effect of their seclusion, and their death ratio soars.

We long for the time when our Mohammedan sisters can throw away their *burqas* and, with the abolishment of *pardah*, they and their Hindu *pardah* sisters can enjoy fully their natural inheritance of sunshine and fresh air and exercise. Especially we plead that these young human flowers be not confined and restricted just as they are blossoming out into womanhood and need more of these life-giving elements.

Marriage

Positive statements of those who are not married are not given in the records. The inference is made, and table IV is based on it (except for the ages 14, 15, and 16), that those who are recorded as 'daughters of' are not married. This would not be true in all cases, though it probably does indicate that all were living in their father's homes.

There were six deaths of married girls before the age of 16. We are thankful for the Sarda Act, but it is apparent that the people need more education as to its necessity, and the officials need to be more vigilant in its enforcement. Detroit's conclusion concerning early marriage and child-bearing at an early age, *i.e.*, before 20, is as follow: 'Undoubtedly this constituted the most important single causative factor in the mortality of this group'. If this is true in Detroit, with a total of only 48 per cent of married girls, how much greater influence it must have on our Indian young women, with a total of 80 per cent married, and about 96 per cent of the 20 to 24 age group married.

Duration of the disease

The average number of months of illness as given in the medical officer's statistics was 11.14 for all : 9.9 for women and 12.3 for men. This is but a rough estimate, and too much emphasis cannot be put upon it. It gives an inadequate picture of the great burden of illness that is put upon only those tuberculous patients who die. Women die quicker than men; as child-bearing immediately precedes the onset of symptoms, this would account for much of their earlier death. However, women very frequently give as their excuse for not being admitted, or for going home from the sanatorium too soon, that their husbands need them to cook their *chapatis* and to care for the babies. These women would surely die sooner than those who receive better care. It also greatly increases the dangers of infection for the rest of the

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TABLE V

Marital status by age and community

Community	Age				
	10–14	15–19	20–24	25 up	Totals
Mohammedan—					
Total number of cases	57	93	106	243	499
Number married	3	54	98	238	393
		1 age 15			
		5 age 16			
Percentage married	5.3	58	92.4	98	76.7
Hindu—					
Total number of cases	11	38	50	103	202
Number married	1	27	48	103	179
		1 age 15			
		2 age 16			
Percentage married	9	71	96	100	83.6
Hindu and Mohammedan, all age groups ..	..	..	..	..	80 per cent
Detroit all groups—					
White, percentage married	..	..	36	..	48
Negro, percentage married	..	..	63		

household, especially the children. Public health propaganda should stress this danger.

Summary and conclusions

The municipality vital statistics show a death rate for pulmonary tuberculosis of 254.8 per 100,000. This does not include corrections of data, nor the non-pulmonary forms of tuberculosis. Clinic statistics show 68 per cent pulmonary and 32 per cent non-pulmonary. Of the deaths recorded, 65.6 per cent were women, although they represent but 41 per cent of the total population. Considering the Hindu and Mohammedan communities only, the death rate for women is 403.8; for men, 148.7; women's being 2.7 times that of men's. There is not much difference between the Mohammedan and Hindu statistics. The female mortality of both communities shows a very high maximum peak of over 83 per 100,000 of the total female population for the 20 to 24 age group.

We believe that these statistics support our opinion that the high female mortality, especially of the 20 to 24 age group, is due in large measure to two factors : early marriage including early child-bearing, and the *pardah* system —always remembering that there can be no tuberculosis without a source of infection. Infection was proved in over half of the homes studied by the previous death of one or more members of the family. Infection is by no means universal in Ludhiana, for less than 60 per cent of the girls over 12 years of age in the Government Girls' High School had a positive tuberculin (Mantoux) skin test.

If this is true, then the problem of tuberculosis in the zenana, in fact the whole tuberculosis problem, centres in the protection of the developing young women and especially of the expectant and nursing mothers. The adverse effect of *pardah* is suggested by the contrast between the death ratios of boys and girls, that of the girl rising sharply soon after she leaves the more free life that her brother continues to enjoy, and by the female ratio continuing above that of the male with the single exception of Mohammedan men over 50 years of age. The deleterious effects of *pardah* lie in the lowering of the resistance of the women and especially in the more intimate contact (practically 24 hours every day) with any infection which may be present in the home.

The effect of pregnancy is proved many times in the clinic by the history of the onset of symptoms immediately following child-birth. The death ratio among young women 20 to 24 years of age in Ludhiana is 83, while in Detroit for this same ' dangerous period ', it is but 16.8. This great difference is due to these same two factors: Detroit has no *pardah* and only 45 per cent of the group were married before 25 years of age. The added strain of pregnancy accentuates the evil effects of *pardah* and of all the insanitary conditions of the home and of any deficiency of diet. We believe many of the tuberculous families in Ludhiana, and in India as a whole, are living in ' primary poverty '.

In addition to general propaganda and clinic work, pre-natal clinics with good tuberculosis diagnostic and instruction facilities would be most valuable for this special propaganda and preventive work. The obstetrician should ever keep tuberculosis in mind and know how best to deal with it. Public Health and General Nursing Schools and *dais'* courses should emphasize this grave danger to their clientele so that their graduates may be efficient

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ROLE OF SOLARIA IN ANTI-TUBERCULOSIS WORK*

By B. JAYARAM, M.B., B.S., T.D.D., L.R.C.P. & S.
Medical Officer, Krishnajammanni Tuberculosis Sanatorium, Mysore
and
A. K. SHERIFF, M.B., B.S., T.D.D.

No infectious disease, much less tuberculosis, can be eradicated by therapeutic measures only. In tuberculosis the infection is universal and morbidity, disability and mortality high. Prevention is cheaper, easier and obviates the suffering and loss of human lives that this disease entails.

Choice of preventive methods

For tuberculous infection to be transmitted, prolonged and intimate contact with an open case is necessary. Infection is not always followed by disease, and if disease does appear there is usually a long latent period. During this interval the body forces, as represented by the word 'immunity', come into play and decide the issue between silent infection and manifest disease. The prevention of tuberculosis, therefore, falls essentially under two heads :—

(*a*) Prevent infection from taking place.
(*b*) After infection has taken place, prevent it from becoming manifest disease.

In view of the fact that 75 to 100 per cent of adults are infected, the latter consideration becomes the more immediate and practical issue, while the former remains the ideal.

Value of home visiting in prevention of tuberculosis

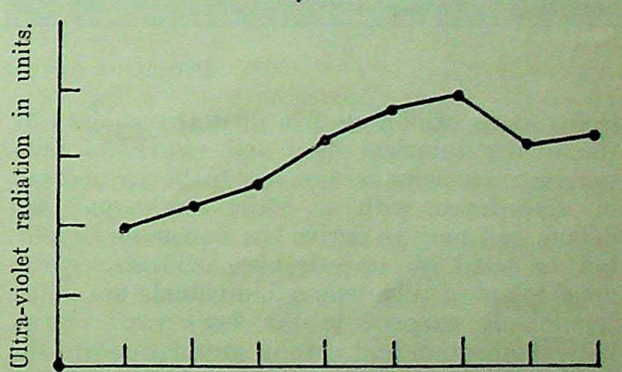
Through the systematic home visiting of all known tuberculosis cases, by a qualified nurse, all contacts are persuaded to be examined by a qualified doctor. Work in Mysore shows that 14 per cent of contacts have signs of manifest tuberculosis in various stages; 15 per cent of these are children under 10 years of age, with enlarged cervical or tracheal bronchial glands, and of these many have lung infection and some have tuberculous peritonitis. There are many more who give a positive intradermal tuberculin reaction only.

Frank cases of tuberculosis are either segregated in their homes and educated in the hygiene of prevention or admitted to some suitable institution. Those that only show signs of infection by a positive tuberculin test and weakness, probably with palpable cervical glands, are picked out and *x*-rayed in order to decide whether active tuberculous disease is present. From the point of view of prevention it is this the largest group that really matters. If the resistance can be increased, there is a good chance of arresting the disease.

Sunlight as preventive of tuberculosis

This can be done by the judicious use of sun, air and physical exercise, which are the most efficient preventive factors. We are all familiar with the health-giving powers of the sun, and the remarks of a well-known authority in respect to its use as a preventive factor in tuberculosis are of interest.

Graph showing the ultra-violet-ray content of the sunlight in units during the months of September and October 1937, as observed in the P. K. Sanatorium, Mysore.



Average sunshine in hours in a day:—

10	10	9	9	10	8	8	7
Cloudy	Cloudy					Cloudy	Cloudy

A. P. Cawadias says: 'Instead of endeavouring to prevent disease by acting on the external factors of disease, a work done by the public health authorities and a matter of hygiene in general, we try to prevent disease by strengthening the constitution of the individual. Sunlight has undeniably proved of the greatest value in strengthening of the constitution, and this should be applied preventively to children, especially to weak children'.

* Summary of a paper, condensed for want of space.

(*Continued from previous page*)

tuberculosis 'officers' in a big or small way, for the homes they visit.

We find that with instruction in the clinic and by the public health visitor in the home, many women are doing good work in the nursing care of the patient and in prevention of further infection. The majority of women are capable of doing likewise—though they cannot read !—and will do so, especially when they learn the good news that tuberculosis is not a hopeless disease and that there is no need for still others of their relatives to contract it.

It is the zenana woman who suffers most. It is also her privilege as well as her duty when instructed and the necessary help is given, to give the death blow to this terrible foe which holds sway in her home.

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The Mysore solarium

The Indian Red Cross Society, Mysore City, has set up a 'solarium' which could aptly be termed a 'day-preventorium', to give practical application to the above knowledge. The solarium is an inexpensive building with a wedge-shaped tiled roof, running north and south, supported on wooden pillars, with a cement floor and open on all sides except for bamboo chicks which can be rolled up or let down to any height to control the admission of the sun's rays. Pre-tuberculous children from infected homes are brought every morning and are given a graduated dose of sun-exposure under strict medical supervision. The smaller children take the sun bath lying down and others who can walk and play are given a loin cloth and a washable hat, and are encouraged to play in the open. The point, however, must be stressed that just as exhibition of a drug is regulated by the pharmacological dose and individual idiosyncrasy, so heliotherapy has to be carried out in accordance with a strict technique and dosage, not only to derive the maximum benefit, but to ward off undesirable incidents, which must follow if tuberculous individuals are indiscriminately exposed to the sun's rays. Strict individualization and careful graduation are the fundamental principles of this treatment.

The morning sun is most potent therapeutically, particularly in our country, as later on in the day the heat is very exhausting. The insolation is begun on the legs and more and more of the body is exposed, increasing gradually the duration of exposure provided no untoward result, either local or general, follows.

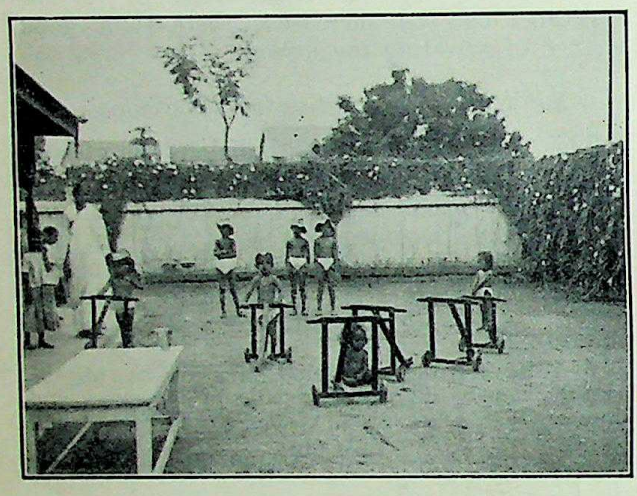
On completion of treatment, each child is given a bath and half a pint of milk, some tomato juice and cod-liver oil. The clinical results so far achieved are very encouraging.

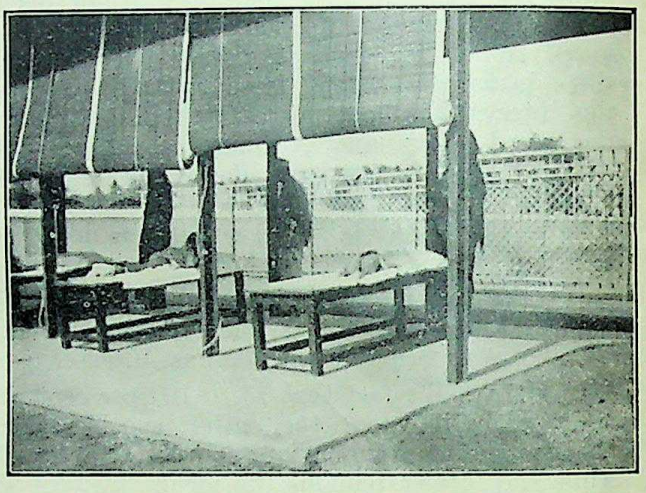
Action of sun's rays

There is a certain amount of controversy as to the exact amount of ultra-violet rays in the sun in India. Experiments carried out in Mysore over a short period (September and October 1937) show that there is a fair amount of these rays available.

In explaining the good results that follow from the work in Mysore, we should not ignore the influence of rays other than ultra-violet and the effect of fresh air (ærotherapy) which has been proved to have a stimulating effect on general metabolism. It is the sunlight as a whole and the air bath which are more important.

Sunlight is a mixture of three groups of electro-magnetic radiations, *viz*, infra-red, the luminous or coloured rays, and ultra-violet rays. The infra-red have a hyperæmic and thermic effect, the luminous a psychological effect and the ultra-violet a biological effect in that they stimulate metabolic, endocrine, nervous and vegetative functions. The effect of sunlight on the human organism may be described as :





Patients under treatment at the solarium.

1. Direct or local.

This action is analgesic, germicidal; and sclerosing, it helps to bring about a rapid healing of any surgical tuberculous condition and is valuable in various other non-tuberculous conditions as well.

2. Indirect or remote.

This causes bronzing of the skin, and has a general powerful stimulating effect on both the mind and body.

Conclusion

The Mysore plan of work is simple and cheap. The structure costs Rs. 300 and is large enough for 12 children to be treated simultaneously. If this plan is adopted all over India, we will come to possess a very effective weapon against tuberculosis. However, in this important prophylactic effort, all depends on the indispensable co-operation of medical men, health authorities and charitable organizations, and it is with the object of interesting such persons and organizations that these few lines have been written.

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METHODS OF DESTRUCTION OF TUBERCLE BACILLI IN THE SPUTUM FOR USE IN INDIAN HOMES, WITH SOME EXPERIMENTS

By R. M. BARTON, M.A. (Oxon.)

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IT is now generally accepted that most infections with the tubercle bacillus, at least those from which pulmonary tuberculosis results, are produced by inhalation of material containing tubercle bacilli. This material may be either moist or dry. In the moist form it is usually inhaled from droplets produced by a patient coughing, sneezing or speaking loudly. These droplets have a very limited range, various writers placing the distance between eight inches and two feet under normal conditions. The second form of inhalation is of dry material which may be from dried droplets or from dried sputum. This has a far greater range and therefore prevention of infection from this source is of the greatest importance. This paper will deal with the destruction of tubercle bacilli in the sputum.

Present methods of disposal of sputum in Indian homes

A number of patients from different parts of India were asked what they did with their sputum before coming to the sanatorium; some were from villages and some from towns. Very few had used any kind of disinfectant. The most common practice appeared to be that the patient spat outside the door of the house. A few used some kind of vessel, often without any cover, and then threw the contents outside, a little distance from the house. One, a medical student, had the sputum buried. In towns one spat in the bathroom, and another poured out the contents of the vessel into the open drains of the town. Several said they had no sputum, which may mean they swallowed it, as they had sputum after coming to the sanatorium. Although it was not admitted by any of the patients asked, it is known that among the poor classes, sick patients spit on the floor of the hut or room in which they are lying. All this means that the majority of patients with a positive sputum are producing vast numbers of bacilli, which no attempt is made to destroy. What is the fate of these bacilli under normal conditions ?

Viability of the tubercle bacillus

Sunlight has a fairly rapid effect on tubercle bacilli in sputum, causing them to die in a period varying from minutes to hours, according to the condition of exposure, such as the intensity of light, thickness of film, and so on.

Calmette (1923) says that the tubercle bacilli in the films of sputum spread on glass slides are killed by 10 minutes' exposure to direct sunlight. Soparkar (1917) found that tubercle bacilli in sputum exposed to direct sunlight are killed in between six and eight hours. Caldwell (1925) found that he obtained positive results with sputum mixed with sterile dust exposed to direct sunlight under typical spring conditions in Arizona for 72 hours. Blanco and Ondovilla (1936) found that in different years they obtained different results from exposing thin films of sputum, 1 to 4 mm. thick, to direct sunlight; sterilization was effected in two hours in August 1929 with temperatures of 39°C. and 45°C.; in 1930–32 sterilization was not effected in six hours in July or eight hours in August with maximum and minimum temperatures of 35°C. and 29°C. in July, and 32°C. and 24°C. in August. In July 1935 with maximum and minimum temperatures of 35°C. and 18°C., sterilization was effected in 11 hours. They conclude that the bactericidal action of sunlight varies with the intensity of the radiations and with the greater or lesser degrees of protection afforded by the composition of the sputum.

Decomposition or *putrefaction* of material containing tubercle bacilli does not have any rapid effect on the bacilli. Calmette found tubercle bacilli virulent in wet mud after four months and in garden soil after seven months. Soparkar isolated tubercle bacilli from decomposed sputum up to 20 days, but not after 26 days. Tubercle bacilli are destroyed in sewage, whether in septic tanks or spread as manure, only with extreme slowness (Calmette). Soparkar also states that it takes three to four hours in direct sunlight and three to four days in diffuse daylight for a pellet of sputum to become sufficiently dried to be capable of being reduced to dust.

When sputum was exposed to *diffuse daylight*, Soparkar found the tubercle bacilli alive after six days and dead after eight days. Blanco and Ondovilla found that sputum exposed to diffuse daylight in a room facing south at Lago Sanatorium in Spain, ceased to be infectious after 28 days.

In *dim light* and in the *dark* tubercle bacilli in sputum live very much longer, in dark corridors and hallways 'for two or three months and probably longer', say Baldwin, Petroff and Gardner (1927); in the dark living virulent bacilli were found after 309 days by Soparkar.

As regards *heat* at temperatures considerably below boiling point, tubercle bacilli in a moist environment are killed by an exposure of 12 hours at 50°C. or four hours at 55°C. (Calmette). Cornet says tubercle bacilli in sputum are killed at 55°C. in six hours. Such temperatures are reached and maintained in some places in India on the ground in open sunlight.

Tubercle bacilli can stand *desiccation* for periods of two to eight months, according to Gloyne (1930), and as long as 10 months, according to Soparkar.

As regards infectivity of dust from rooms of patients, several workers have experimented and obtained living tubercle bacilli from

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the dust. Calmette found tubercle bacilli in dust, but experimenting with guinea-pigs and rabbits, considered that 'practically speaking . . . dusts contaminated with dry bacilli offer but little harm to healthy respiratory passages'. All workers do not, however, agree with this. Wilcocks (1938) was able to obtain positive results from two out of six specimens of dust collected from the floor of African huts.

The practical conclusions to be drawn from the above outline of work on the viability of the tubercle bacillus under certain conditions seem to be :—

(1) That sputum poured out or spat out in the open in sunny weather in India soon ceases to be infectious and, therefore, infection from this source cannot be great.

(2) That sputum spat on the floor inside houses or in places not exposed to sunlight is potentially a source of danger.

Some methods used for collection and destruction of tubercle bacilli in sputum

One of the most usual methods of collecting sputum is not one of the most satisfactory, namely, the common type of spittoon with a wide flanged top and a comparatively narrow opening. This provides a large space on which sputum can collect and dry, and many types are difficult to clean out. Flies also collect on the edge and, as Brown and Petroff (1919) have shown, are capable of carrying away virulent bacilli in their bodies, although they were unable to infect guinea-pigs by food contaminated by such flies. Where there is careless spitting, it does, however, save sputum falling on the ground.

Cheap aluminium sputum cups with removable hinged lids and rounded inside at the bottom are available at about Rs. 9 a dozen. Failing such a proper sputum cup, an ordinary tin with a wide mouth and something to cover it may be used. But such vessels should contain something to keep the sputum moist. Water may be used and then the whole may be boiled from two to three minutes and the contents may be then safely thrown out. But there is the objection that on sentimental grounds people may not like to boil the contents in the place where they usually have a fire for cooking and will be unwilling to make another fire.

For use in the country it has been suggested that earthen pots may be used containing earth or sand. A cover should be used to prevent flies gaining access to the sputum, and the whole should be thoroughly heated over a fire each day. There is the same objection with this method as with boiling.

A method of dealing with sputum, advocated for general use, should have the following advantages :—

(1) Simplicity of use by even uneducated people.

(2) Efficiency and speed of disinfecting power.

(3) Cheapness.

(4) Safety.

One of the commonest agents used is lysol, and this is now available fairly widely in India, at least in the small towns. But it is not very cheap, and when obtained in the usual form is definitely dangerous, when, as is usual in villages and even town homes, there is no special place to put it away from children. Its disinfecting power is, however, good when it is used in about a 2 per cent solution. Adams (1938), for example, found that no growth of tubercle bacilli could be obtained after sputum had been mixed with lysol in $2\frac{1}{2}$ per cent dilution for half an hour.

Some experiments with disinfection of sputum

In order to test the efficiency of certain other methods of destroying tubercle bacilli, a few experiments have been carried out, using the Löwenstein-Jensen medium for control purposes.

(1) *Kerosene oil*

There is a popular belief among some classes that kerosene oil has a strong disinfecting power based, no doubt, on its lethal effects on insects. Sputum from several patients was mixed and then kerosene oil was poured on the top, and the whole was mixed and left for periods of one hour and two hours. The floating kerosene oil was pipetted off and then part of the sputum was cultured direct on to the medium; the cultures showed a heavy contamination as the kerosene oil had no effect at least on some of the bacteria other than the tubercle bacilli. The other part of the sputum was treated with 6 per cent sulphuric acid for 20 minutes, then centrifuged at high speed for 20 minutes, the supernatant fluid pipetted off and the sediment washed with distilled water and centrifuged again for 20 minutes. The sediment, when cultured, showed a vigorous growth of tubercle bacilli for the sputum treated for both one hour and two hours, as heavy as on controls made from part of the sputum not treated with kerosene oil.

(2) *Cow-dung*

There is also a popular belief in the efficacy of cow-dung as a disinfectant, and floors on which a patient has spat are treated with cow-dung, sometimes with the definite idea of disinfection. An attempt was made to see whether cow-dung had any effect on the viability of tubercle bacilli, but unfortunately a method was not found which was capable of destroying all the mass of contaminating bacteria, without destroying the tubercle bacilli also. Therefore, no conclusion could be arrived at up to now as to whether cow-dung had any effect, but the fact that, as mentioned earlier, tubercle bacilli are destroyed in sewage, either in septic tanks or spread as manure, with extreme slowness, makes it seem unlikely that cow-dung will have

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any other effect than preventing the spread of dust to some extent.

(3) *Certain chlorine compounds*

Some of the chlorine compounds are fairly readily available, being used in connection with the chlorination of water supplies, and, therefore, two were tried—perchloron and calx chlorinata.

The technique employed was that sputum from several patients with positive sputum was mixed together and then portions were treated with equal amounts of various strengths of perchloron and calx chlorinata in distilled water and left for 40 minutes at room temperature (about 90° to 95°F.). The mixture was then centrifuged at high speed for 20 minutes, the sediment was washed with sterile distilled water and again centrifuged for 20 minutes, and then was cultured on to several tubes of Löwenstein-Jensen medium. Controls of sputum treated with 6 per cent sulphuric acid only were also made. In some earlier experiments sputum was treated for five hours, but this was found unnecessary. The strengths of the chlorine used were 1 per cent, 2 per cent, 3 per cent and 4 per cent. In earlier experiments stronger solutions were also used, but were found unnecessary.

The immediate effect of the chlorine solution on the sputum was striking. Above 2 per cent strength the sputum was very speedily homogenized with effervescence and became watery with a little shrivelled-up material floating on the surface. With 1 per cent and 2 per cent the action was slower, but by the end of 1 hour the sputum was homogenized by the 2 per cent solution. Smears from all the sediments showed tubercle bacilli.

The cultures were examined weekly up to six weeks. The controls showed heavy growth, but only the sputum treated with 1 per cent perchloron and calx chlorinata showed any growth, and in these tubes some showed no colonies and others showed only two or three colonies. There was no growth from the sputum treated with 2, 3, or 4 per cent solution.

One objection to the use of chlorine solution is that the solution is not stable and, therefore, an experiment was made using solutions which had been mixed five weeks earlier and kept in screw-capped bottles in a cupboard. Of three tubes cultured from sputum treated with 1 per cent perchloron and 1 per cent calx chlorinata only one tube of each showed three colonies; the others were negative. The 2, 3 and 4 per cent solutions showed no growth.

Conclusion

The above experiments have shown that at a room temperature of 90° to 95°F., which is a temperature found widely at least in South India and in the hot weather in North India, a 2 per cent solution perchloron and calx chlorinata when mixed in equal quantities with sputum for one hour will kill the tubercle bacilli. Both these chlorine compounds are fairly readily available and are cheap, costing about eleven annas a pound. When kept in a screw-capped bottle the disinfecting power of these solutions is fairly constant, at least up to five weeks. The chlorine solution should be mixed with the sputum for an hour before the sputum cup is cleaned, and the contents of the cup may then be thrown out. The chlorine solution should not be poured into the cup before, as the chlorine may be unpleasant to the patient and produce coughing. A heaped teaspoon (such as is bought in the bazaar for ¼ anna) to one pint gives about a 2 per cent solution.

Summary

(1) Enquiry among patients showed that very few made any effort to disinfect the sputum in their own homes.

(2) A short review is made of our knowledge of the viability of the tubercle bacillus outside the body and leads to the conclusion that spitting in the open in sunny weather in India is not likely to lead to much spread of infection. Sputum spat in places not exposed to sunlight is potentially dangerous.

(3) The collection of sputum in the common type of spittoon, in tins and earthen pots is discussed.

(4) Lysol, while efficient in disinfecting power, is not cheap, and in unskilled hands has its dangers.

(5) Some experiments are described dealing with destruction of tubercle bacilli in sputum :

(*a*) The popular belief of the disinfecting power of kerosene oil is proved to be without foundation.

(*b*) Certain chlorine compounds, perchloron and calx chlorinata, such as is used for water chlorination, etc., are found efficient when used in a 2 per cent solution for one hour at room temperature.

(*c*) If kept in a screw-capped bottle, these solutions were proved to be still efficient five weeks later.

(*d*) The chlorine compounds are easy to use and are efficient and cheap.

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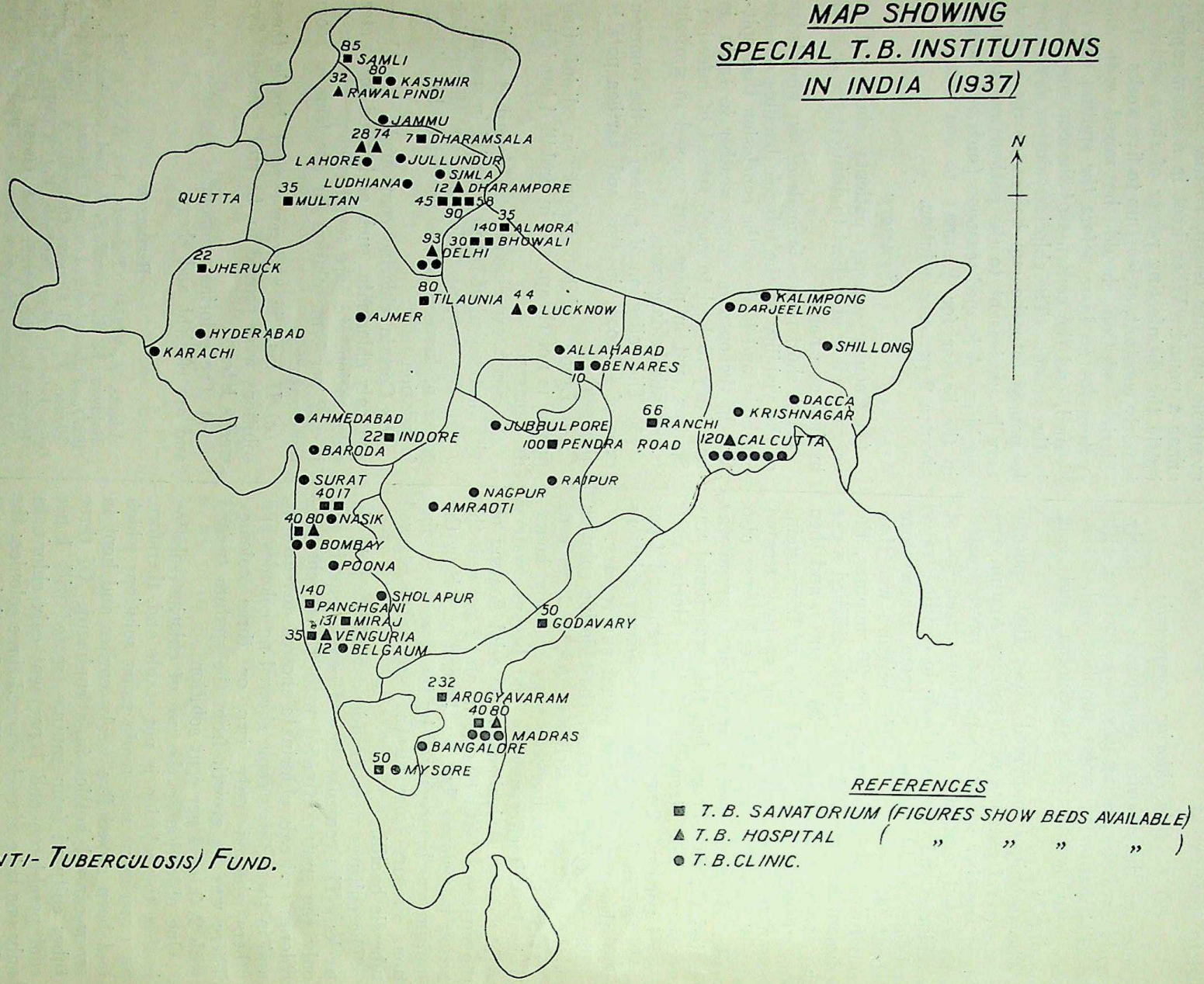
MAP SHOWING SPECIAL T.B. INSTITUTIONS IN INDIA (1937)



K. G. T. (ANTI-TUBERCULOSIS) FUND.

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Indian Medical Gazette

SEPTEMBER

THE SPECIAL TUBERCULOSIS NUMBER

THE success of the special tuberculosis number we published last year encouraged the chairman and committee of the King George Thanksgiving (Anti-Tuberculosis) Fund to suggest the publication of another special number this year. The suggestion was a very welcome one, as at the moment tuberculosis is a subject of vital interest to all concerned with India's welfare, and should be especially so to our readers and members of the medical and allied professions generally; further, we ourselves very much appreciate the expert help and advice that we receive from the secretary and the editorial committee of the fund in arranging this special number.

The last special tuberculosis number was devoted almost entirely to treatment and it was agreed that this number should be devoted to the prevention of tuberculosis in India.

In the case of tuberculosis, as in other chronic infectious diseases, the problems of prevention and cure are intimately associated and it is hard to imagine any preventive campaign that did not entail the treatment of those already affected, or conversely any treatment campaign that would not, by limiting the source of infection, prevent the disease from spreading. However, the committee have chosen for publication in this number, as far as possible, articles in which the subject is considered primarily from the point of view of prevention.

As far as tuberculosis in India is concerned, the outstanding event of importance during the last year has been the conception and launching of the King-Emperor's Anti-Tuberculosis Fund by Her Excellency The Vicereine. The value of this public-spirited action of Her Excellency is represented not only by the number of rupees that have been and will be subscribed, but by the widespread attention that has thereby been focussed on this disease. The Rajah who gives a lakh of rupees does so because he understands the gravity of the tuberculosis problem in India and wishes to contribute his share, but the peasant who is persuaded to part with an anna in exchange for a token wants to know more about it, and the loss of his anna as much as the acquisition of the tuberculosis token will tend to make him tuberculosis minded. More good will be done by directing the healthy minds of India's three hundred million peasants than by curing the diseased bodies of relatively few.

The good that the fund has achieved in this direction can never be measured; it may not be very apparent to-day but it is very real, and if the effort is sustained the maximum effect will be felt some years hence when the next generation is reaching manhood. We can, however, add up the sums that have been collected, and these have reached a very impressive total.

The problem that we are now facing is not how the money can be spent to the advantage of tuberculous patients in India—this can be done in a thousand ways—but how it can be spent to the greatest advantage of the maximum number of patients and at the same time directed towards stamping out this scourge. For inspiration and guidance we can look to other countries, but we shall have to work out our own problem in our own way. In the first place expenditure on the same scale, proportionately (either to the population or to the number of tuberculous patients), as has been incurred in certain other countries during the last two decades, would absorb the whole of India's resources, but even if the cost could be left out of consideration no foreign scheme could be adopted successfully in this country. The disease in India is different from the disease that is seen in Europe, and there is no doubt that with her many racial types and her many different climates, its clinical manifestations and epidemiological behaviour will show marked variations within the country itself. In this connection there are many questions to be answered, and local research must form an important part of the scheme.

Most tuberculosis workers seem to be agreed that the pivotal point of any anti-tuberculosis scheme must be the tuberculosis clinic or dispensary. The funds that have been subscribed will allow of the establishment of a few such dispensaries in each province. It will be far better to establish well-equipped and well-run clinics in a few selected areas than to dissipate the resources of the fund by establishing a large number of ill-equipped and inefficient ones. An ill-run clinic will not only achieve nothing but it will do actual harm by giving the tuberculosis clinic a bad name and thereby eventually bringing the whole scheme into disrepute. On the other hand, the success of a well-run clinic will encourage others to establish them in their areas, and, if the demand is insistent enough, the money will be forthcoming from some source or another.

A certain amount of unselfishness will have to be displayed, as in many areas where funds have been subscribed it will not be possible, at first at any rate, to carry out any relief measures, and here the inhabitants will have to comfort themselves with the knowledge that the scheme as a whole is progressing satisfactorily towards its final goal, the eradication of tuberculosis from India. A selfish, parochial outlook will be disastrous to the scheme and already the establishment of sanatoria in Bengal has been hampered by unreasonable local opposition; we say 'unreasonable' because the presence of a well-run sanatorium would be beneficial rather than detrimental to the health of the local community. Perhaps the greatest enemy to the

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scheme may be the apathy and a fatalistic attitude of the people themselves, but the prosecutors of the scheme will also find that they have prejudice and active opposition to overcome, and it is the duty of every practitioner of scientific medicine to attempt to establish himself as a leader of thought in his own locality and to counteract this prejudice and opposition with all his will; if he does this he will be doing far more for the cause than he would by subscribing a few rupees.

Though no concrete scheme has been formulated in this number, we feel that the opinions expressed by some of India's leading tuberculosis workers as to the various measures that should be adopted to control tuberculosis in this country will be of very great value to our readers and to those whose duty it will be in the various provinces to organize the campaigns in our war against tuberculosis.

KING GEORGE THANKSGIVING (ANTI-TUBERCULOSIS) FUND

A REVIEW OF ACTIVITIES FOR THE YEAR, 1937–38, PREPARED BY THE SECRETARY, DR. B. K. SIKAND, M.B., B.S., D.P.H.

SINCE the publication of the last 'Tuberculosis Number' of the *Indian Medical Gazette* in April 1937, the Fund, which at the moment represents India's national effort in the preventive campaign against tuberculosis, has continued its activities.

Tuberculosis has been described as a 'social disease' because its prevalence and intensity vary according to different social and economic conditions. In this country the problem of prevention is intimately bound up with many aspects of life, such as education, *purdah*, early marriage, improvident reproduction, wasteful customs, nutrition, housing and insanitary habits. The solution to most of these predisposing factors is education.

The anti-tuberculosis campaign in India, therefore, resolves itself into the following:—

(1) Correction of the general ignorance in respect of the causes and prevention of tuberculosis;
(2) Abolition of harmful social customs and habits;
(3) Improvement of housing conditions, *e.g.*, town planning, sanitary improvements, etc.;
(4) Provision of tuberculosis dispensaries for early diagnosis of cases and contacts and for home visiting;
(5) Establishment of hospitals, sanatoria and preventoria.

A campaign against tuberculosis which does not include treatment of the disease is inconceivable just as is an antimalarial scheme without suitable treatment of malaria. No hygienist would, therefore, underestimate the importance of treatment; at the same time a successful campaign in western countries is concerned more and more with preventive methods and the development of social hygiene, although treatment of infected persons must also hold an important place as a preventive measure.

Training of tuberculosis workers

Early diagnosis is essential for cure and prevention; it follows that one of the important activities of the fund is to help medical practitioners to improve their knowledge of the diagnosis, treatment and prevention of tuberculosis. It has been made clear that a great demand exists for such training and in 1937–38 three post-graduate courses were organized by the Fund with the help and co-operation of the respective heads of the medical departments, and medical and anti-tuberculosis institutions. These courses were held in Madras (September 1937), in Bombay (November 1937) and in Calcutta (January 1938). The number of applications from those who desired to attend far exceeded the available accommodation, as many as 571 applications being received for 75 seats. Seventy-four doctors in all were admitted to these three courses and the Fund paid actual travelling expenses to all out-station candidates up to a maximum of Rs. 100 per head whilst no tuition or admission fees were charged.

Educational activities

Propaganda work has been carried on during the year both through provincial and district committees and during the tours of the organizing secretary, 4,165 pamphlets and leaflets and 14,014 posters and charts were supplied free of charge on request to educational institutions and public health workers, and 5,123 pamphlets and 1,662 posters were sold to different organized bodies. A large stock of posters, leaflets, handbills, and charts suitable for popular education is always maintained in the Fund's office. A pamphlet entitled 'Knowledge of tuberculosis in pictures' and a leaflet 'The tuberculosis clinic' were added during the year.

Co-operation with other agencies

The Maternity and Child Welfare Organizations both at headquarters and in the provinces have helped to create a liaison with their centres, where expectant and nursing mothers receive instruction and by this means the Fund has been able to approach large and appreciative audiences.

Through the help of the President of the All-India Women's Conference, it has been possible to obtain the co-operation of women social workers; it is hoped that through this medium the Fund will enlist an increasing number of workers.

Exhibitions

Anti-tuberculosis propaganda is inseparable from general health propaganda and the Fund has co-operated in a number of health exhibitions by sending suitable material.

Co-ordination

The central office collected information regarding tuberculosis institutions throughout India and attempted to guide and co-ordinate anti-tuberculosis activities in different areas. A map showing the numbers and sites of tuberculosis institutions is included in this special number.

Provincial committees

The 16 provincial and state committees in existence, all continued to do useful work in spite of financial difficulties. They have continued to carry on an intensive anti-tuberculosis campaign all over India by means of lectures, radio talks, magic lantern demonstrations and by the distribution of popular literature. In addition, committees in Ajmer-Merwara, Assam, Bangalore, Baroda, Bengal, Bombay and Central Provinces opened new clinics. Ten new tuberculosis clinics were opened during the year, which, besides being centres of prevention and education, have, by providing ambulatory treatment, done much useful work.

Mysore has begun to develop a method of dealing with the tuberculosis problem by means of a number of solaria which are in some ways comparable to the day preventoria and sanatoria of Poland. In the latter country tuberculosis patients for whom hospital accommodation is not available attend during the daytime, and are accommodated in large open sheds or special buildings where they have the advantage of open air treatment and of being removed for some hours each day from their unhealthy home surroundings. In Mysore, where close co-operation exists with the Maternity and Child Welfare organizations, children from tuberculosis-infected homes, discovered as a result of health visitors' work, are encouraged to attend the solaria for a definite period each day. There, in addition to graduated sun exposure, they are given extra milk, cod-liver oil and other necessary medicines. In a country like India, where the great need for hospital or sanatorium accommodation for tuberculosis patients can never be

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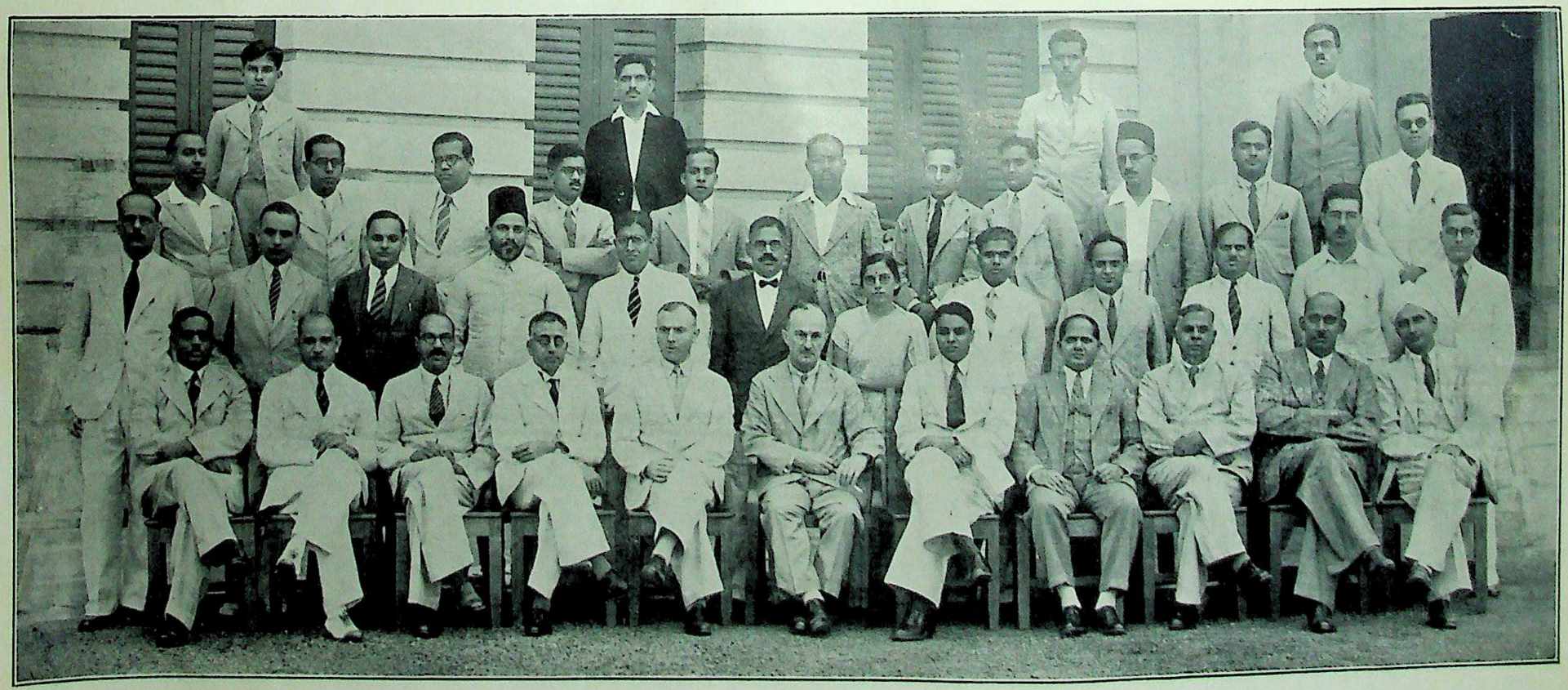
KING GEORGE THANKSGIVING (ANTI-TUBERCULOSIS) FUND
(Indian Red Cross Society)
POST-GRADUATES AND LECTURERS
Madras—September 1937



M. A. Paul, M.B.B.S. (*Narakal, Br. Cochin*), P. Seshagiri Rao, L.M.P., L.T.M., D.P.H. (*Gudivada*), T. G. Rajagopal, L.M.P. (*Kinathukadavu*), K. Ramachandra Naidu, L.M. & S. (*Tinnevelly*).

T. A. Sundaram, B.A., L.M.S., B.S.Sc. (*Triplicane*), M. K. Subramaniam, L.M. & S. (*Kumbakonam*), P. Rangachar, L.M. & S., B.S.Sc. (*Bangalore*), V. N. Ramakrishnan, L.M.P. (*Thally, Salem*), C. T. Samuel, L.M.P. (*Poonamallee*), J. S. Gangadharam, L.M.P. (*Kundha Bridge, Nilgiris*), Md. Mumtaz Ali, M.B.B.S. (*Madras*), A. S. Chary, L.M.P. (*Bellary*), C. P. Kamath, M.B.B.S. (*Mangalore*), Y. Ramasubrahmannyam, M.B.B.S. (*Cocanada*), Dr. B. H. P. Pai, M.D.

K. Venkat Rao, M.B.B.S., V. Rama Iyengar, B.A., L.M. & S. (*Madras*), R. Sundaram, M.B.B.S. (*Travancore*), Syed Niamathulla, L.M.P. (*Madras*), T. S. Venkatrama Ayyar, M.B.B.S. (*Dindigul*), Y. Suryanarayana Rao, L.M.P. (*Tanuku*), N. Sakunthala, L.M.P. (*Kavali*), P. Ramanujachary, M.B.B.S. (*K. G. Hospital, Vizagapatam*), A. K. Ramachandran, L.M.S. (*Palghat*), Y. Dhanapathy, M.B.B.S. (*Madras*), R. A. Johnson, M.B., B.Ch., D.P.H. (*Trichinopoly*), Dr. K. S. Sanjivi, M.D.

Dr. K. Vasudeva Rao, M.D., M.R.C.P., T.D.D., Dr. P. V. Cherian, F.R.C.S., D.L.O., Dr. S. Thambiah, M.R.C.P., F.D.S., Dr. S. Ramakrishnan, L.R.C.P. & S., Lieut.-Col. Cruickshank, Major-General Bradfield, Dr. Sikand (*Secretary*), Dr. Koman Nayar, D.O.M.S., Dr. C. Totadri, L.M. & S., Dr. R. M. Mathew, Dr. T. S. Tirumurthi.

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fully met, this is a method which seems to have great possibilities both in respect of prevention and cure, particularly for those living in urban areas.

International relationship

The Fund continued to be a member of the International Union against Tuberculosis and in this way has kept in touch with the development of anti-tuberculosis work in other countries. We have also been able to establish relationship with the Imperial Tuberculosis Bureau of the Empire Conference on the care and after-care of the tuberculous. Several representatives from the provincial committees have recently had the opportunity of studying at first hand the work of different tuberculosis institutions in England.

King-Emperor's Anti-Tuberculosis Fund

The year 1937 has been an auspicious one for the tuberculosis movement in this country as Her Excellency the Marchioness of Linlithgow has launched a vigorous campaign against this disease in India. Her Excellency's appeal on behalf of the King-Emperor's Anti-Tuberculosis Fund has received a wide response and the list of subscriptions steadily mounts. There can be no doubt that this call for funds deserves the fullest support from every citizen of the Indian Empire because tuberculosis is not only a common and formidable enemy, but can only be conquered if every individual takes part in the campaign and gives of his best to the common cause.

Her Excellency in issuing the appeal for the King-Emperor's Anti-Tuberculosis Fund added that if she was successful, as she hoped to be, it was intended to found an Anti-Tuberculosis Association for India, consisting of a central body supported by provincial and state organizations which would be expected to affiliate to the central body and to apply a uniform policy to the circumstances of the different areas in which tuberculosis prevailed.

A NOTE FOR THE GUIDANCE OF PROVINCIAL ORGANIZATIONS

1. *Tuberculosis dispensary clinic*

This institution occupies a front position in the organization for combating tuberculosis in a given area and is the centre for preventive work.

In urban areas tuberculosis dispensaries should be established, having their own staff under a medical officer, either full-time or part-time. Except in cities sufficiently large to warrant the establishment of a separate building fully equipped and staffed, it is advisable to locate the tuberculosis dispensary within the boundaries of a well-established hospital in order to utilize the facilities for *x*-ray diagnosis and surgical work that should be obtainable there.

In rural areas, on the other hand, with scattered and less developed communities, the organization of separate dispensaries devoted solely to tuberculosis work is impracticable and here tuberculosis clinics should be opened in existing dispensaries on one or more fixed days each week. This will necessitate the doctors in charge of these particular dispensaries having some specialized knowledge of tuberculosis work.

Emergency beds, attached to a tuberculosis dispensary clinic, are useful for patients requiring observation for a day or two or for minor surgical treatment, but patients should not ordinarily be retained in such beds for more than a week.

2. *Domiciliary treatment*

Owing to the small number of beds available for tuberculosis cases in general hospitals and special tuberculosis institutions, domiciliary treatment must perforce be resorted to in a majority of cases for many years to come. In home treatment and care of patients and their families, the health visitor and the care committee play an important part. These are discussed below. The organization of open-air centres where patients can be kept by day may be helpful especially when patients come from congested areas.

3. *Health visitor*

Formerly known as the tuberculosis nurse this worker is preferably a woman and a trained nurse. Owing, however, to the great shortage of women nurses in India it will be necessary in many areas to employ others to perform the duties of tuberculosis health visitor. In some provinces and states educated girls who have passed the matriculation examination may be given a short specialized course of training at a central well-organized dispensary and when considered qualified may be posted as health visitors. In other places it may be found necessary to utilize men for this work and sub-assistant surgeons, sanitary inspectors or even exceptionally efficient dispensers or dressers may be employed. In any case it seems desirable to observe the principle of having a uniform rate of pay in each provincial or state area for any person performing the duties of a tuberculosis health visitor.

4. *Care and after-care committees*

These should be organized on a voluntary basis in connection with all tuberculosis dispensaries and should consist of non-officials and officials. The committee meets at the dispensary where the circumstances and difficulties of patients requiring aid are explained. Each case is considered on its merits, given financial assistance if required, and, where desirable, helped to find suitable employment. Without such committees, composed of members who are familiar with the life and difficulties of patients and their families the work of a tuberculosis dispensary is seriously hampered and its scope restricted. Even after patients have ceased to be under treatment, the committee should endeavour to keep in touch with them where possible.

5. *Training of tuberculosis staff*

The success of all efforts to deal with the problem will depend on the provision of an efficient and sympathetic body of workers. The establishment of suitable training centres for doctors, health visitors, and members of care committees should therefore be accepted as an important function both for the central and for the provincial organizations. The school teachers in village schools are capable of rendering valuable assistance in anti-tuberculosis work and for them a suitable course of training would seem to be desirable.

The training should be undertaken at provincial and state centres in major provinces and states, while smaller units should look to their adjoining large neighbours or to the central organization for help in this respect.

6. *Hospitals and sanatoria*

The removal of the infective case from close contact with his family and associates is one of the most effective measures for preventing the spread of the disease. Unfortunately it is expensive. For cases requiring prolonged treatment in bed accommodation arranged on a district basis is advisable, tuberculosis wards in existing hospitals being constructed for the purpose.

A large city may maintain its own tuberculosis sanatorium or combined institution comprising hospital and sanatorium with an after-care organization, but generally sanatoria should be organized on state or provincial or even on a divisional basis. It is desirable that all these institutions should be of a simple type of construction.

In some areas, the establishment of tuberculosis colonies adapted to Indian conditions may be possible.

7. *Preventorium methods*

The value of open-air schools in combating tuberculosis is proved and any steps in this direction are of value. Similarly the establishment of play-grounds and open-air shelters are of help in the campaign.

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8. *Co-operation*

The central, provincial and state associations will require to co-operate closely with all organizations, official and non-official, interested in the tuberculosis problem. Government departments, such as the medical and public health, are most closely concerned and a great deal of the actual work will be carried out by and through them. The Education Department and official agencies for development and rural reconstruction should also be consulted. Among voluntary agencies the Red Cross Society, St. John Ambulance Association and Maternity and Child Welfare organizations are interested and have been carrying out active tuberculosis work in a number of areas. Charitable and social organizations which are concerned in any way with the problem should be approached to help. The best way to link up all these bodies is to appoint representatives from them on the council of the association.

It should be remembered that the success of all tuberculosis measures will depend on obtaining the co-operation of the entire medical profession, especially the general practitioner.

9. *Funds*

The various activities mentioned in this note are all legitimate objects upon which the funds of the association may be spent. In allocating funds in the first instance an endeavour should be made to spend not less than 75 per cent on institutions and organizations primarily of a preventive character (the chief of which is the tuberculosis clinic) and in this way districts will derive immediate benefit from the sums contributed by them.

10. *Housing*

In view of the wide-spread existence of slum conditions which contribute so largely to tuberculosis in urban areas and of the tendency that unfortunately persists towards the creation of more overcrowded areas, tuberculosis associations should take a leading part in stimulating measures directed towards the removal of existing slum conditions and their prevention in future.

11. *Education work*

All kinds of educative work on the control and prevention of tuberculosis fall within the scope of a tuberculosis association and should form an important part of its activities.

NOTICE

THE editorial committee of the King George Thanksgiving (Anti-Tuberculosis) Fund wishes it to be made quite clear that approval of the above papers, as suitable for publication, does not necessarily carry with it approval of the principles enunciated therein. They do not wish the number to represent only their own points of view, but rather those of all workers in India, who, by their position and achievements, can be considered competent to express an authoritative opinion.

Special Article

B. C. G. VACCINATION IN PRACTICE*

By L. NÈGRE,

Chef de Service a l'Institut Pasteur, Paris,

and

R. K. GOYAL, D.SC., PH.D., M.R.C.P., F.R.S.E.

From the School of Tropical Medicine, Calcutta

WE have already described the experiments showing the immunizing powers of B. C. G. in the case of small laboratory animals, cattle and anthropoid apes.

Calmette and Guerin tried to determine the behaviour to natural tuberculous infection of vaccinated monkeys and cattle. The experiments of Wilbert at the Pasteur Institute, Kindia, had shown that monkeys vaccinated by subcutaneous injections of 50 mgm. of B. C. G. or 5 oral administrations of 50 mgm. were resistant to infection when placed in contact with tuberculous monkeys, whilst the controls contracted the infection.

Cattle were vaccinated by intravenous injections of 20 mgm. of B. C. G. or preferably by 50 to 100 mgm. by the subcutaneous route. The resistance thus conferred lasted at least a year; it could be maintained by similar subcutaneous revaccinations.

For successful vaccination, it is indispensable to separate the heifers from the tuberculous surroundings immediately after birth, otherwise there is danger of natural infection before the immunity by B. C. G. can be established.

Calmette and Guerin wanted to determine if B. C. G. vaccination alone could stamp out tuberculosis in 5 years in a heavily infected farm, where all measures of isolation and disinfection were suspended. The vaccination was to be performed within the first 15 days of life and the cattle were to be revaccinated each year by the subcutaneous route with 100 mgm. of B. C. G. Guerin, Richart and Boissiere vaccinated 88 cattle in a heavily infected farm at Gruville. Vaccination was repeated each year and all the new-born calves were also subjected to the same treatment. A large number of cattle had to be destroyed for economic reasons. Amongst the grown-up animals 10 out of 53 showed tuberculous lesions; 30 heifers were born and brought up in these surroundings, they were simply vaccinated as detailed above, but no other precautions were taken. They were sacrificed and found to be free from lesions ascribable to tuberculosis. Twenty out of these 30 were born of mothers who were either definitely suffering from tuberculosis or were suspects. The young ones were brought up on the unboiled mother's milk in the first month of life.

Thousands of vaccinations effected in cattle in different countries fully bore out the efficacy and safety of B. C. G.

The Veterinary Commission of the B. C. G. conference recognized the immunizing properties of the vaccine and encouraged its use in the prophylaxis of bovine tuberculosis.

One rigidly controlled experiment was undertaken in 1926 by the Commission of Alberta, Canada. The report of Professor A. C. Rankin published by the National Research Council of Ottawa established the harmless nature of B. C. G. in the case of healthy calves.

*Submitted direct to the *Indian Medical Gazette.*

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Fifty calves (25 vaccinated and 25 controls) isolated from all tuberculous contacts were tested one year after vaccination by an intravenous injection of virulent bacilli. All the controls had tuberculous lesions. Only one vaccinated calf, dead at 3 months, was found to be tuberculous. Three presented calcified and healed lesions, 1 showed 5 small calcified tubercles and 20 were free from both macroscopic and microscopic lesions.

In another experiment, 50 calves (25 vaccinated and 25 controls) were kept for 8 months in an infected herd. Amongst the controls, 5 died before the date fixed for destruction, 7 presented extensive caseous lesions, 72 per cent had microscopic lesions.

In the vaccinated, 8 had small non-extensive lesions, while 68 per cent were free even from microscopic lesions.

Ascoli vaccinated more than 5,000 cattle since 1925 and Gerlach in Austria more than 4,000 calves; none of the vaccinated beasts slaughtered after a year presented any lesions, although they came from a herd containing 50 per cent infected animals. Sanz in Chili vaccinated 2,554 calves and 993 pigs from 1925 to 1929. During these 4 years, none of the vaccinated animals presented tuberculous lesions.

At Berkeley, California, a Commission consisting of Haring, Traum, Hayes and Henri vaccinated 282 calves less than 10 days old and 15 older ones. One hundred and eighty-two belonged to a heavily infected herd, while 90 taken from tubercle-free farms were observed with an equal number of controls. These authors concluded in favour of the efficacy of the vaccination.

Assis and Dupont in Brazil, the Ukranian Commission of Karkoff, Buxton and Stanley Griffith in England also concluded in favour of the efficacy and safety of B. C. G. in the case of cattle.

The results obtained with cattle constituted a solid basis for the application of anti-tuberculous vaccination of human beings.

The method of administration to infants

The bacillary infection is much graver for the infant in the first few months of its life than for older children or adults. At this early age, it is absolutely dependant on people who look after it. If a very young baby were to be brought up in tuberculous surroundings, it would almost never escape the contagion. The preventive vaccination should therefore be practised as early as possible after the birth of the baby, in order to protect it from threatened infection, and to raise its resistance in case of future illness.

The vaccination of infants after the first few days of birth can be effected by the subcutaneous route, as in young cattle. But the subcutaneous administration in the newly-born is not popular with the relatives, hence Calmette had recourse to the oral route. A large number of authors have shown that microbes and toxins easily penetrate the intestinal mucosa of animals and of newly-born babies; only incompletely differentiated cells form the intestinal lining in the first fortnight of life.

B. C. G. vaccine, being constituted by living, avirulent and non-tuberculogenic bacilli, must be freshly prepared. It cannot be conserved for more than 10 days. It is therefore impossible to stock it and to despatch it in advance. The Pasteur Institute, Paris, sends it out only when the birth of the child is notified. It should be administered in the first 10 days of life of infants on the breast.

The Paris Institute delivers the vaccine in ampoules, each one represents a single dose for oral administration. Each dose is mixed with a little milk in a teaspoon, and is administered half-an-hour before suckling. Three doses are given on alternate days as early as possible after the birth, *i.e.*, third, fifth, and sixth or seventh, eighth and tenth days.

The ingestion is absolutely inoffensive, no digestive disturbance or malaise being produced. There is no inconvenience or danger in vaccinating the newborns of healthy parents. The vaccination protects against an accidental infection, which is always a possibility.

It is desirable not to give B. C. G. to premature, jaundiced, malformed or obviously debilitated infants, as the accidents occurring naturally would be attributed to B. C. G. by the relatives. Professor A. Couvelaire has shown that approximately 12 per cent of non-vaccinated babies born of tuberculous mothers die of congenital debility, which manifests itself in the first month of life.

It is always necessary to isolate the newly-born from the tuberculous parents from the very day of birth. This isolation should be strictly enforced for a few months after vaccination as the immunity develops gradually. If complete segregation be impossible, the usual precautionary measures to combat the disease should be taken for an indefinite period.

The duration of immunity conferred by B. C. G. is not definitely known, it is therefore necessary to vaccinate by the oral route at the end of the first and third years and later at seventh and fifteenth years of life.

The same procedure of 3 doses given at 48-hour intervals should be followed, the vaccine should be given on an empty stomach in the morning, half an hour before the first meal.

The first human experiments

The animal experiments having demonstrated the safety of B. C. G., Calmette and Weill-Halle tried it on an infant. It was tried in July 1921 on a suckling, who was in constant contact with his tuberculous grandmother and was thus almost sure to be infected; 6 mgm. in 3 doses were given shortly after birth, the infant grew up normally and remained free from tuberculosis.

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After this favourable attempt, Weill-Halle and Turpin vaccinated 317 infants from July 1921 to July 1924. These cases were kept under strict observation, as 67 of them were born and brought up in bacilliferous surroundings. The total quantity of B. C. G. for ingestion was later on increased to 3 centigrammes.

Up to January 1927, only 1 out of 317 cases died of tuberculosis. The fatality occurred at 4 months of age, the baby being suckled from his birth by his tuberculous mother; 14 others died of diseases other than tuberculosis. No functional trouble nor any arrest of development was noted in any of these cases.

The harmlessness of B. C. G. for babies appeared thus to be established. The Paris Institute decided from July 1924 to distribute B. C. G. to private practitioners for vaccination purposes. In order to prepare reliable statistics, a circular letter was issued during 4 years to all the practitioners who employed B. C. G. A register was specially kept for all the babies who were either born of tuberculous mothers or were brought up in bacilliferous environments. The Institute Pasteur thus followed 3,607 special cases from July 1924 to July 1928. The total number of vaccinations during this period was 114,000.

The mortality from tuberculosis of babies 1 month to 1 year old brought up in tuberculous families was 1.5 per cent. All the cases which were reported to have died of meningitis were counted as having died of tuberculosis even though death occurred during the first 3 months of life. In the case of vaccinated infants aged 1 to 4 years, the mortality from tuberculosis, calculated on the same basis, was 0.3 per cent. Mortality from all diseases of babies 1 to 12 months old (vaccinated and in contact with tuberculous patients) was 7.3 per cent and those of 1 to 4 years old, 1.7 per cent.

There being no official statistics of mortality from tuberculosis, Calmette sent a questionnaire to 204 dispensaries or offices. The replies showed that 4,854 non-vaccinated babies born from 1925 to 1927 showed a mortality rate of 15.9 per cent, whilst the 2,368 vaccinated, of the same age, presented a 3.4 per cent mortality rate.

It is evident that for children of the same age, born and brought up in exactly similar conditions and examined by the same institutions, the preventive vaccination reduced the tuberculous mortality by nearly three-quarters.

In another investigation, 814 babies were vaccinated but were brought up in contact with their tuberculous mothers for at least a year after birth. They showed a 2.4 per cent mortality rate from tuberculosis, whilst the death-rate from all causes was 10.6 per cent.

The value of vaccination is clearly demonstrable by these figures for the category of children whose mortality is admitted on all hands to be very high.

More recent statistics

At present, more than 1,200,000 vaccinations have been carried out in France and nearly the same number in other countries.

The last investigation conducted by Calmette was definitely in favour of vaccination. Eight thousand and seventy-five babies in tuberculous contact were observed by 114 dispensaries; the mortality from all causes from birth to 1 year was 4.6 per cent in the vaccinated and 16 to 25 per cent in the non-vaccinated.

Five hundred and fourteen infants of doctors' families were vaccinated at birth during 8 years, *i.e.*, 1925 to 1932, 60 of them undoubtedly lived with tuberculous people, 43 were in contact with suspects, 140 were revaccinated once or twice at 1 and 3 years of age. From 1924 to 1932 inclusive, 7, *i.e.*, 1.3 per cent, died, and only 1 succumbed to a malady suspected to be tuberculosis.

At Brest, J. Querangal of Essarts and Madam de Carbonnieres of Saint-Brice followed up the babies in 823 families for 8 years. The general mortality was 7.3 per cent in 1,193 vaccinated babies and 17.7 per cent in 1,084 non-vaccinated controls. In 262 families in which babies were exposed to tuberculosis with certainty, the mortality from all causes in 366 vaccinated cases was 11.2 per cent between 1 month and 7 years, but 23 per cent in non-vaccinated controls. Deaths, probably due to tuberculosis, were 6.2 per cent in vaccinated and 13.2 per cent in the controls. In 561 families apparently free from tuberculosis, the general infantile mortality between 1 month and 7 years was 5.5 per cent in 827 vaccinated and 13.6 per cent in 616 non-vaccinated.

The above-mentioned authors could establish by comparison that in the families of Brest, the general infantile death-rate was 7.6 per cent between 0 to 1 year and 11 per cent between 0 and 3 years. In tuberculous families of the same region, the vaccinated babies had a general death-rate of 5.7 per cent from 0 to 1 year and 7.6 per cent from 0 to 3 years, but the controls had 14.7 per cent and 20.8 per cent mortality respectively.

In 463 families, the general mortality in 640 infants born before the era of vaccination (1927) was 20.1 per cent. In exactly the same families, babies born after 1927 showed 9.7 per cent mortality for vaccinated and 17.7 per cent for non-vaccinated. These statistics clearly establish the beneficient effects of B. C. G. The results obtained in other countries confirm the conclusions drawn from the French figures.

Professor Badouin vaccinated 8,452 newly-born babies from 1926 to 1936. There was a decrease of 55.4 per cent in the general death-rate of the vaccinated. The mortality from tuberculosis was 70 per cent less in the vaccinated, although the non-vaccinated were also cared for by the nurses of Bruchesi Institute. As a matter of fact, the vaccinated had 43 per cent visits and the non-vaccinated 64 per cent.

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In the families where babies died of tuberculosis, 94 per cent of the vaccinated survived and only 78 per cent of the non-vaccinated.

The tuberculous mortality of infants living in tuberculous families was less by 51.5 per cent in the vaccinated.

The experiments of William H. Park at New York were particularly suggestive, as these were conducted since December 1926 on babies born of tuberculous mothers in the hospital, who were regularly examined; 208 of these babies were vaccinated and 350 were kept as controls up to 1st January, 1930. After 3 years of observation, deaths from tuberculosis in the non-vaccinated of 0 to 1 year were 8 per cent, and only 0.9 per cent in the vaccinated. In 1 to 2 year-old infants, the non-vaccinated had a tuberculous mortality of 3.8 per cent and in the vaccinated it was *nil*.

From 1927 to 1934, Aronson and Dannenberg in Philadelphia vaccinated *per os* 70 newly-born babies and kept 163 as controls. Out of this number 41 vaccinated and 84 non-vaccinated were born and brought up in tuberculous families. From amongst the 84 non-vaccinated, 10, or 11.9 per cent, died of tuberculosis between the ages of 4 to 30 months, on the other hand, only one or 2.4 per cent of the vaccinated died. Fifteen other vaccinated babies and 41 controls were reared in families containing members with either healed or supposedly-healed lesions. Two out of the 41 non-vaccinated died of tuberculosis between 7 to 11 months of age, but none of the vaccinated contracted the disease. Out of the 14 vaccinated and 38 controls brought up in tubercle-free families, none developed the disease.

More than 100,000 babies were vaccinated in Roumania since 1927. The general mortality rate was reduced by more than half.

Tuberculin skin reactions after B. C. G.

We have previously pointed out the difference between allergy and immunity. But a marked allergic reaction is a sign of absorption of B. C. G. It is therefore interesting to determine the tuberculin reaction in vaccinated subjects.

Unfortunately in the case of babies who have been vaccinated and brought up in contact with open cases of tuberculosis, it is impossible to determine whether the positive tuberculin reaction is due to B. C. G. or to the superimposed infection.

This difficulty has been overcome by Leon Bernard, R. Debre and M. Lelong. The babies born of tuberculous parents were removed to healthy families and vaccinated. There was thus no question of being brought up in baneful surroundings.

The non-vaccinated babies segregated from birth always remained tuberculin-negative, whilst out of 105 vaccinated cases, 50 showed, at least once, a positive cutireaction (von Pirquet's reaction).

Debre and Cofino extended this study by increasing the dose of tuberculin in negative reactors, the amounts used being 0.1, 0.5 and 1 mgm. of tuberculin. All the 141 controls gave a negative reaction, whilst 88.6 per cent of the cases vaccinated *per os* gave a positive reaction (out of the 117 positives, 42 von Pirquet's and 75 Mantoux's tests were positive).

In a more recent study, Debre, Lelong and Pictet demonstrated 97 per cent positives in vaccinated babies, who had been kept away from tuberculous people. The allergy appeared generally within 3 months and persisted up to 5 years.

The intradermal reaction with graduated doses was found to be much more valuable than cutireaction, the percentage of positives being much higher.

The positive allergic reactions establish without a shadow of doubt that B. C. G. is absorbed by the intestinal route. It appears that allergy following oral vaccination appears slowly, is often transitory and is not easy to detect, as in 50 per cent of cases it can be revealed only by giving increasing doses by the intradermal route.

One can conclude from the work of Debre that allergy conferred by B. C. G. can persist up to 5 years. It is therefore possible that the immunity also lasts for a fairly long time. In the case of cattle and monkeys, it endures for 15 to 18 months, and can be prolonged by annual revaccination.

The revaccinations *per os* in infants are practised at 1, 3, 5, 7 and 15 years. The ingestion by allergic subjects is without any danger, therefore tuberculin reactions are not elicited before the revaccination. In cases of positive allergic reactions, it is useless to revaccinate, as the positive reaction indicates either the persistence of B. C. G. or the presence of a virulent infection.

B. C. G. in older children

The oral route of administration had been exclusively used for the newborn, Calmette and Guerin wanted to know if older children or adults could also be vaccinated by the same method. Their suggestion was followed by Vaucel and Saleun who administered *per os* 3 doses of 1 centigramme of B. C. G. to non-allergic black people of all ages. These authors showed that 55 per cent became tuberculin-positive 3 months later. After a second test, 25 per cent more reacted positively. Boisseau and Nodenot made non-allergic subjects of 2 to 50 years of age ingest a single dose of 3, 5 or 10 centigrammes of B. C. G. The tuberculin reactions were positive in the following proportion :—

40 per cent for 3 centigrammes.
80.25 „ „ 5 „
89.74 „ „ 10 „

Debre, Lelong and Pictet, however, had less favourable results in the case of the segregated children. They administered 3 fresh doses of 1 centigramme to 101 non-allergic infants 10

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months to 4 years of age, who had already received B. C. G. *per os* at birth. Six months later only 50 per cent gave positive tuberculin reactions.

As B. C. G. is absorbed by the intestinal mucosa in an appreciable number of infants other than the newly-born, so it is very easy to administer it to subjects of all ages. It would be essential in such cases to exclude tuberculosis by clinical, radiological and allergic tests. The fact, however, must not be lost sight of that the best age for vaccination is the first 10 days of life.

If for some reason the vaccination is not done at birth, one should wait till the age of 6 months, because an accidental infection very early in life cannot be excluded by skin tests before this age. The intradermal or cutireactions are obtainable after a long period, if the infection be very mild (*'paucibacillare'* as the French call it). From 6 months to 2 years of age, the vaccination can be performed if the subject be in good health and were to give 2 negative cutireactions performed at 7 days interval. The baby should be isolated from all suspected cases and 3 doses should be administered as described before.

Revaccinations at 3, 7, and 15 years are to be performed in the same way. The Pasteur Institute, Paris, has prepared a special B. C. G.-NR for the use of subjects more than two years of age.

Subcutaneous vaccination

The guinea-pigs and cattle having given favourable results in the subcutaneous antituberculous vaccination, the problem of the use of the same method was broached in the case of tubercle-free adults.

The first vaccinations were tried on a few hundred young soldiers in Senegal and Madagascar.

It is well known that black people coming from regions containing very few or no Europeans are extremely susceptible to tuberculosis. When such people are brought to Europe, they readily succumb to infection and the disease resembles the form observed in European babies.

It was therefore necessary to find out if the subcutaneous route could be utilized for the vaccination, as the intestinal route is not very favourable for adults. The amount selected was 1/10 to 1/20 mgm. as this dose did not cause the production of a cold abscess at the point of inoculation. Four hundred Senagalese and Malgaches were vaccinated, and none of them developed tuberculosis.

At the same time Weill-Halle and Turpin in Paris and J. Parisot at Nancy and Wallgren in Sweden undertook the experiment of vaccination by the hypodermic route.

Weill-Halle worked with sucklings of a few weeks to a few months old; he started with 1 mgm., then reduced it to 1/4 mgm., then 1/20, 1/50 and finally 1/100 mgm. in order to decrease the local reaction. The injection of 1 mgm. always caused the appearance of a local subcutaneous nodule (granuloma), which ultimately healed without having any ill-effect on the general health. The dose of 1/100 mgm. produced a slight subcutaneous infiltration which persisted for some weeks and was gradually absorbed. Later, Weill-Halle selected the axillary border of the scapular region as the site of injection and injected 1/50 mgm. at two points, *i.e.*, 1/25 mgm. in all. If the baby was in healthy surroundings or had been segregated for several weeks, two or more cutireactions were always performed at 8 days' interval, to exclude tuberculosis. If the baby lived in a bacilliferous home and gave a negative cutireaction, it was isolated for one month. If the skin test at the end of this period was again negative, then only was the baby vaccinated.

Parisot and Saleur used a single dose of 1|100 mgm. for 269 subjects of 1 to 16 years; 139 had been in tuberculous contact and 130 in healthy surroundings. The babies were examined clinically and radiologically, 2 skin tests also being performed. The local reactions were observed especially in the beginning of the experiment, the dose employed at this stage being 1/4 mgm. In only 9 cases, or 3 per cent, was there breaking down and an ulcer, but no general reaction was produced even in cases in tuberculous contact.

At the Ulleval Hospital of Oslo, Heimbeck vaccinated the probationer nurses by injecting 1/20 mgm. subcutaneously. The country being very thinly populated, a large number of adults are negative-reactors to tuberculin. It is therefore not astonishing that the majority of nurses are tubercle-free and contract the disease after attending tuberculous cases. Fifty-seven out of the 457 probationer-nurses were affected with the disease and could be classified as follows :—

Two hundred and sixteen cases giving a positive skin test—2 cases of tuberculosis (9.9 per cent).

Two hundred and forty-one negative reactors —55 cases of the disease (23 per cent).

It was thus clearly demonstrated that the positive reactors had a marked resistance to the disease as compared to the negative reactors.

In 1927, 44 negative reactors consented to be vaccinated, and all remained free from tuberculosis. Twelve cases giving a negative skin test refused vaccination; 5 of them became tuberculous.

In Norway, Sheel found that the medical students who gave a negative skin reaction before working in the tuberculosis wards were three times as liable to fall a prey to tuberculosis as the allergic students. The morbidity of the negative reactors was reduced by half if they were vaccinated.

The allergic reactions make their appearance in 78 per cent of cases 2 to 4 months after oral vaccination. If repeated injections are given and the dose is increased 100 per cent become allergic.

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Wallgren injected B. C. G. intradermally in non-allergic babies, a mild local reaction was produced, the nodule never became more than pea-size in diameter and disappeared altogether in a few weeks. The ante-allergic period is inversely proportionate to the amount of the vaccine injected. The dose of 0.5 to 1 mgm. causes a positive reaction after 3 weeks, 0.25 mgm. after 4 weeks, 0.1 mgm. after 6 weeks, 0.05 mgm. after 7 weeks. If there be no reaction, gradually increasing doses are given till a positive reaction is obtained.

Wallgren especially chose for vaccination the babies from tuberculous homes. Such cases were separated from the family immediately after birth and were kept in a building especially reserved for the purpose. They were fed on the breast and were returned to their families only when the positive skin test was obtained. The minimum time of separation was 6 months in 6 cases and up to 2 years in certain others. The tuberculous contact lasted from 4 to 72 months.

Out of 230 cases, more than a third were vaccinated at birth, others at school age. They were *x*-rayed at least once a year and were kept under observation as out-patients.

Only 1 out of the 230 showed a hilum tuberculosis; the father and elder brother of the case had had pulmonary tuberculosis. The stomach contents showed the presence of Koch's bacilli; the baby was completely cured by the end of the year.

In 4 cases, the hilar shadows were slightly larger than normal.

In 7 cases, it was not found possible to say if the hilar shadows were normal.

Two hundred and sixteen cases presented normal appearances.

Two out of these 230 cases in tuberculous contact died of other diseases than tuberculosis.

The prophylactic vaccination was introduced in Gothenberg in 1927.

The mortality figures tabulated for every five years were 4.3, 4.2 and 3.4 per 1,000 before the vaccination was introduced. The year 1927 being a period of transition showed a mortality rate of 3.9 per 1,000. From 1928 onwards, vaccination was rigidly enforced, only 1.4 per 1,000 succumbed during the next 5 years. This showed a decrease in mortality by less than 60 per cent. In 1933, the death-rate fell still further to 0.3 per 1,000. On the other hand, the general mortality from tuberculosis, especially pulmonary, did not show the same diminution. The sources of infection were not reduced but the mortality from tuberculosis fell, and this could only be due to B. C. G. vaccination.

Wallgren, William Park, C. Kereszturi and Bela Schick prefer the subcutaneous or intradermal route to the oral. These authors consider the method to be more reliable, producing allergic reactions more regularly. They utilize 0.0001 to 0.05 mgm. for the subcutaneous injection and 0.003 to 0.15 mgm. for the intracutaneous. Sixty per cent of the subcutaneous vaccinations produce cold abscesses and 90 per cent of cases give positive tuberculin tests. The allergy disappears in 26 to 33 weeks. These authors prefer the intradermal route because abscess formation is avoided, but the allergy produced is less intense and less frequent. None of their vaccinated cases died of tuberculosis, but 3 per cent of controls went to the grave.

Criticisms

As happens with all new methods, certain objections have been raised against this vaccination. Certain authors have stated that B. C. G. cannot be absorbed by the intestinal route, therefore the oral vaccination is ineffective. It has already been shown that young rabbits and guinea-pigs which have received B. C. G. *per os* become allergic, although slowly. The same holds good for newly-born babies as has been shown by Robert Debre and his collaborators. Other proofs of the absorption of B. C. G. are its presence in the organism and the leucocyte or histological changes observed in the vaccinated infants.

A. Calmette, B. Weill-Halle, A. Saenz and L. Costil have shown in the case of 5 non-allergic sucklings aged 6 months to 2 years the absorption of B. C. G. administered by the oral route. When the blood was cultured by the method of Loewenstein, B. C. G. was demonstrable 3 to 5 hours after its administration in 3 of the cases. Zeyland and Madam Zeyland obtained positive cultures from the organs of babies vaccinated 6 months before or earlier and dead of non-tuberculous disease. In the case of babies vaccinated *per os*, Pittaluga and Garcia demonstrated an early monocytosis rising to 15 per cent on an average, accompanied or more often followed by a prolonged lymphocytosis and corresponding diminution of neutrophils, with a slight deviation to the left of Arneth's index. These leucocytic changes denote a defensive activity of the vaccinated organism resembling the changes occurring after a natural infection; if anything, they are more rapid in onset. Pittaluga and Garcia conclude from this the existence of absorption of B. C. G. by the intestinal mucosa.

The histo-pathological study of vaccinated animals and babies has revealed the same phenomenon. In the guinea-pig vaccinated 2 to 5 days after birth and sacrificed at different intervals, Jensen, Morch and Orskov have observed the agglomeration of epithelioid cells and fibroblasts in the liver and lungs. The lesions cicatrize between 6 to 7 months. The same changes have been observed in vaccinated infants by Ciuca, Francke and Vitner Rosenthal. The mesenteric glands and liver have shown marked proliferation of reticulocytes and also of macrophages and fibroblasts, and a less common infiltration by granulocytes.

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Another proof of intestinal absorption was furnished by Saye. His radiographic studies of vaccinated infants revealed the presence of benign lesions, which could not be due to anything else but B. C. G.

These data show definitely that the intestinal route can be utilized for vaccination.

Certain clinicians have propounded the hypothesis that B. C. G. may become virulent after remaining as a parasite for a long time. No facts have been adduced in favour of this contention. In fact the bile-treated bacilli are eliminated little by little, and disappear completely later on. At this moment immunity also disappears in its turn. Autopsies of vaccinated infants have never revealed tuberculous lesions. Zeyland and Madam Zeyland isolated B. C. G. from the organs of the vaccinated and found it to be inoffensive by animal passage.

Certain clinicians have attributed to B. C. G. the onset of tuberculous meningitis in the vaccinated. So far no proof in favour of this idea has been brought to the notice of the Permanent Commission on B. C. G. An overwhelming majority of such babies has been brought up in tuberculous surroundings and has not been separated from the contacts after vaccination. We feel therefore right in affirming that the meningitis is due to infection contracted soon after birth before the immunity by B. C. G. can be established. It must not be forgotten that no method of vaccination is effective against massive and repeated infection, as occurs when a newly-born baby is brought up by a tuberculous mother.

People with ideas of an opposite order fear that B. C. G. has become too attenuated in virulence to be an active immunizing agent. They can rest assured that the experiments on laboratory animals have shown it to be as active as ever in its immunizing properties.

The use of B. C. G. in different countries of the world has shown definitely its efficacy in combating tuberculosis.

Medical News

INDIAN MEDICAL COUNCIL

IN exercise of the power conferred by clause (*a*) of sub-section (1) of section 3 of the Indian Medical Council Act, 1933 (XXVII of 1933), the Central Government is pleased to nominate Lieutenant-Colonel B. Z. Shah, M.R.C.S. (Eng.), L.R.C.P. (Lond.), I.M.S., Director of Health Services and Inspector-General of Prisons, Sind, to be a member of the Medical Council of India, from Sind, with effect from the 6th July, 1938, *vice* Lieutenant-Colonel M. J. Holgate, I.M.S., resigned.

RAI SHAMBHU DAYAL SAHIB GOLD MEDAL

A GOLD medal called the 'Rai Shambhu Dayal Sahib Gold Medal' will be presented for the best prize essay on a public health subject to be announced each year.

The subject of the next essay is 'A Scheme to fight against Tuberculosis in these Provinces with ways and means for raising money for the campaign'.

The competition will be open to the general public, including the medical and the public health workers in the United Provinces.

The essay is to be written in simple Hindi and should not exceed 3,000 words in length.

Essays should reach the Medical Officer in charge Provincial Hygiene Institute, United Provinces, Lucknow, by 15th November, 1938.

The name and address of the competitor must be distinctly written on each essay submitted and the envelope should have the words 'Prize Essay' in the top left-hand corner.

The Director of Public Health, United Provinces, shall judge the merit of the essay and his decision with regard to the award of the medal shall be final.

No correspondence will be entered into on the subject of the competition. No essay will be returned.

INTERNATIONAL MEDICAL POST-GRADUATE COURSES IN BERLIN

THE Berliner Akademie für ärztliche Fortbildung is holding the following medical post-graduate courses in autumn of 1938:—

1. Course in the field of internal diseases in which lives are suddenly endangered (from 3rd to 8th October). Fee: RM 50.

2. Post-graduate course on the subject of ailments of muscles and joints (from 10th to 16th October). Fee: RM 50.

3. Progress in the field of hormones and vitamins (from 17th to 22nd October). Fee: RM 50.

4. Course on tuberculosis in the Berlin Municipal Hospital for Tuberculosis (from 24th to 29th October). Fee: RM 50.

5. Course in diseases of the ear, nose and throat (from 26th September to 8th October). Fee for the whole course: RM 150; for the theoretical part of the course: RM 100.

6. Course in accident-surgery (from 17th to 22nd October). Fee: RM 70.

7. Post-graduate course on the subject of neurotic diseases (from 24th to 29th October). Fee: RM 50.

8. Special courses in all branches of medicine with practical work at the bedside and in the laboratory, to be held every month. For these courses participants are requested to communicate their wishes in order to find a complete programme on their arrival.

Courses 1 to 7 will be held in German, and the special courses also in foreign languages.

For programmes and further information apply to the Geschäftsstelle der Berliner Akademie für ärztliche Fortbildung, Berlin NW 7, Robert Koch-Platz 7 (Kaiserin Friedrich-Haus).

Foreign doctors and German doctors resident abroad are granted a reduction of fare of 60 per cent on the German Railways Company's lines; a foreign doctor can reduce the cost of his stay considerably by utilizing the so-called 'registered marks'; it is advisable to arrange matters with the local bank before starting.

CONTRIBUTIONS

THE following contributions have been received by the Editor, and have been forwarded to the Central Fund of the King George Thanksgiving (Anti-Tuberculosis) Fund, New Delhi:—

Dr. K. Prasada, Health Unit, Partabgarh, Oudh	Re. 1
The Medical Officer, State Makrai, C. I. ..	Rs. 2

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Reviews

THE BRITISH ENCYCLOPÆDIA OF MEDICAL PRACTICE. Under the General Editorship of Sir Humphry Rolleston, Bt., G.C.V.O., K.C.B., M.D., D.Sc., D.C.L., LL.D. 1938. Butterworth and Company (Publishers), Limited, London. (To be completed in 11 volumes, of which seven have already been published.) Sold in complete sets only. Cash price, Rs. 25 per volume. Also available on the instalment system at Rs. 10 per month. Price, Rs. 26-8 per volume. Only available from Messrs. Butterworth and Company (India), Limited, Calcutta. Volume II. Pp. 767 plus xxiii plus 63

THE second volume of this encyclopædia commences with apraxia, covers the whole of the B's, and in the last few pages commences the C's, with caisson disease, cancer (a short general chapter), cancrum oris, canities, and carriers in infectious disease.

Of special interest to readers in India will be found Major W. S. Patton's article on arthropods and disease, Sir Rickard Christopher's on blackwater fever, and Dr. Hamilton Fairley's on bites and stings.

Of the subjects of more general interest Dr. George Bray has contributed a useful and concise chapter on asthma and the chapter on backache and lumbago by Dr. James Mennell gives one of the most precise descriptions of the examination of a patient suffering from back pain that we have ever seen: it is a chapter that should prove of immense value to the practitioner, who is continually being consulted by his patients about this troublesome condition. Under aviation details are given for the examination of pilots; though the final examination for the air services will obviously be carried out by a trained expert, it is useful for the practitioner to be able to indicate what physical shortcomings are likely to disqualify his patient who may thus be saved disappointment later.

There is a chapter of nearly fifty pages on blood examinations by Dr. Lionel Whitby; this is an important chapter which we are glad to see entrusted to a hæmatologist who, whilst maintaining the best traditions of the British school, does not consider that this necessitates being ten years out of date, in these rapidly moving times: the chapter includes two excellent coloured plates.

The chapter on blood transfusion by Dr. F. A. Knott is another that we can commend for its practical value; the various circumstances under which transfusion may have to be given are taken into consideration and simple as well as the more complicated apparatus described.

The high standard of this excellent publication is well maintained in this volume.

THE PHARMACOLOGICAL SHOCK TREATMENT OF SCHIZOPHRENIA.—By Dr. Manfred Sakel, M.D. Authorised Translation by Joseph Wortis, M.D. Revised English Edition. 1938. Nervous and Mental Disease Publishing Company, New York and Washington. Pp. xviii plus 136. Illustrated. Price, $2.75

IT has long been known that a certain number of patients, some of whom have been well advanced in a psychosis, have recovered after experiencing some sort of 'shock', for example, that initiated by being knocked unconscious or bitten by a snake. Further, many drugs and other therapeutic agents which have appeared to produce remissions in individual cases are of shock import. Dr. Julius Schuster, of the University Psychoneurologic Clinic at Budapest, was the first to make the striking observation that a series of mental patients were under-sensitive to insulin and from this fact he concluded that treatment with insulin might improve their condition. Pharmacologic treatment of schizophrenia, as described in this monograph by Dr. Manfred Sakel, has now become an established procedure in many hospitals for mental disorders. As Dr. Nolan D. C. Lewis states in the introduction he has written to this monograph, there exists at present a consensus of opinion which grants (1) that the clinical aspects of the disorder can be removed or favourably influenced in a relatively large percentage of certain types of patients, at least for a period of time, (2) that some types are not favourably influenced, but continue as before in their disorder, (3) that there is a considerable variety of psychological and physiological reactions during the therapeutic procedure itself, apparently depending not only upon the inherent individual integrations of the patient, but also upon the nature of the insulin, and the technic of the physician, (4) that the results have brought more forcibly to mind a possible reversibility in at least some of the physiopathological and psychopathological processes involved in the disorder, and (5) that metabolism is influenced by the insulin situation as indicated by the reported changes in the blood sugar, amino acids, potassium, inorganic phosphorus, cholesterol and serum proteins, with the degree of change not always dependent upon the size of the dose of insulin administered. Dr. Sakel differentiates between 'insulin hypoglycemia', that is, the insulin treatment used for morphinism and 'hypoglycemic shock treatment' which consists of the deliberate production of severe shocks and the extension of the duration of hypoglycemia. Dr. Sakel begins by describing the methods of administering this treatment which he divides roughly into four phases. The 'shock', according to Dr. Sakel, may consist of either coma or an epileptic seizure. In the former case, the shock starts with profuse perspiration hence this is termed a 'wet shock'. The progressive somnolence may be interrupted by psychotic excitement but ends typically in coma. Less commonly than this type of shock is a 'dry shock'. This consists of a sudden severe and typical epileptic seizure with tonic and clonic spasms, tongue biting, etc. According to Dr. Sakel, it is not possible to predict in advance the epileptic type of hypoglycemic reaction. Further, there are two varieties of epileptic convulsion met with in hypoglycemia: the 'dry' shock or early epileptic seizure which occurs in the second or third hour after the initial injection and a later epileptiform seizure which occurs in the fourth or fifth hour of hypoglycemia and not infrequently in the course of a wet shock. This late epileptic convulsion must be regarded as a danger signal and is an indication for an immediate interruption with intravenous glucose. After a careful description of the method of treatment, Dr. Sakel goes on to discuss subsidiary features, including psychotic reactions, of which the most common is paranoid attitudes. Of the theoretical aspects of the treatment, Dr. Sakel advances a tentative theory which will repay study, the essence of which is that the effect produced depends first upon 'neutralization of the excitant hormone' and second, 'on the vagotonic muffling of the cell'.

The introductory preface by Dr. Foster Kennedy is so extremely interesting that it alone makes the book worth buying. It is to be hoped that this important monograph will obtain the reception it deserves in India where psychiatry is still in a more or less embryonic stage.

O. B-H.

PNEUMONIA AND SERUM THERAPY.—By F. T. Lord, M.D., and R. Heffron, M.D. Revised Edition of Lobar Pneumonia and Serum Therapy. 1938. The Commonwealth Fund, New York. Oxford University Press, London. Humphrey Milford. Pp. xiv plus 148. Illustrated. Price, 4s. 6d. Obtainable from Oxford University Press, Bombay and Calcutta

THE successful treatment of certain types of pneumococcus pneumonia has been made possible through advances in the investigation of the pneumococcus and pneumococcic serum. But difficulties in obtaining early bacteriologic diagnosis, cost of serum, lack of

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familiarity with its use, and fear of reactions have delayed the wide adoption of the method.

This book is a product of valuable research on pneumonia, carried out in Massachusetts and financed by the Commonwealth Fund. It was first published in 1936 under the title of 'Lobar pneumonia and serum therapy', which has now been changed to the present one, as recent investigations have shown that specific therapy is also applicable to atypical cases and even to some cases of bronchopneumonia. The present edition furnishes new information on dosage, the use of rabbit antiserum and the results of specific treatment of types I, II, V, VII, VIII and XIV pneumonia.

The book also refers to clinical diagnosis and selection of cases for treatment and describes, in a practical manner, the Newfold method of typing, procedures for initiating serum therapy and the precautions that are necessary prior to its administration.

R. C.

NEUROLOGY.—By Roy R. Grinker, M.D. Second Edition. 1937. Baillière, Tindall and Cox, London. Pp. 1000, with 406 figures. Price, 38s.

THIS is an excellent book on neurology written by an author who has devoted his whole attention to the study of the diseases of the nervous system in one of the important institutions in America. That this volume has passed through a second edition within a short period of three years is enough evidence to prove its usefulness to the medical profession. Errors and omissions are fully rectified and all modern and up-to-date knowledge incorporated, the author has succeeded in bringing the book to a high standard.

The writer has devoted nearly a hundred pages to the consideration of the anatomy, physiology and embryology of the nervous system, specially in so far as it is necessary for the study of the pathology and symptomatology of nervous diseases. A considerable amount of space has also been used to discuss the general pathological reactions occurring in the nervous system and also the methods of neurological examinations. This has been done in a masterly way and will be very useful to students and practitioners. The treatment of the vegetative nervous system and its disease processes is also to be praised. The chapter on intracranial tumour is very comprehensive and the pathological study of these new growths has been undertaken in a manner which leaves hardly anything more to be added. There are numerous figures illustrating their anatomical and histological appearances and extensive use has been made of arterial encephalography and ventriculography in the diagnosis and localization of cerebral tumours. In discussing the prognosis and treatment of this malady, the writer has maintained a judicious conservatism which befits a physician of Professor Grinker's experience and reputation.

The chapter on infective diseases of the nervous system may be read with interest not only for its usefulness but also for the ignorance which has been displayed by a neurological specialist in modern bacteriology. 'Mucosis capsulatus causes a greasy sticky exudate' is meaningless. The term influenza has been used to denote the bacterial organism, *Hæmophilus influenzæ*. In his eagerness to discuss the bacteriology of purulent meningitis, the writer has forgotten to observe even the common rules of grammar. These could have been avoided if arrangements had been made for careful proof reading.

However, in the compass of 1000 pages the author has been able to collect an abundance of facts which have been carefully put together and, in this way, he has rendered a great service not only to those who are specially interested in neurology but also to students and practitioners in general. There is a plethora of illustrations which are not only well chosen but also of excellent quality. The paper, printing and the general appearance of the book are excellent and the publishers deserve to be congratulated for this.

This book should not only find a place in every library but should be read and kept for ready reference by every medical man.

M. N. D.

PEDIATRIC SURGERY.—By Edward C. Brenner, M.D., F.A.C.S. 1938. Henry Kimpton, London. Pp. 843, with 293 illustrations. Price, 45s.

IT is not very often that we have the pleasure of reading such a well-balanced and attractive book on one of the special branches of surgery. By virtue of his varied experience and sympathetic understanding of the little patient, the author is well qualified for this difficult undertaking. The reader will be delighted with the motto of this book, which reads 'In corpore pueri non est locus chirurgi violentæ'. It was the author's intention to present a volume, neither encyclopædic nor compendial in character, but of practical value to the pædiatric surgeon. The reader will soon discover that the result has more than justified the attempt.

The text of the book has been divided into nine parts each consisting of well indicated sections, making for easy reading and quick reference. The author has been ably assisted by his colleagues in the writing of chapters on special subjects. There is no doubt that anæsthesia in children requires great skill and discrimination. On this subject the contribution of Dr. Drysdale Buchanan is both interesting and up to date. Dr. Lester Unger has written the chapter on 'blood transfusion' with the authority that his experience commands. Improved technique in recent times, of the operative procedures in 'cleft-palate' and 'hare lip' has been described with excellent diagrams by Dr. Harold Vaughan. The section on thoracic surgery in children, always a difficult subject, is in the capable hands of Dr. Louis Davidson to whom the reader will be grateful for many a useful hint. A whole volume could be written on urology in children but Drs. Clarence Bandler and Albert Milbert have omitted very little of importance in this section.

This is a book which we can strongly recommend to the practising surgeon and the general medical practitioner. The binding, printing, and illustrations are excellent, but the absence of a bibliography is to be regretted. The author and his collaborators deserve the success they have achieved. They also deserve our gratitude for emphasizing that 'the child's body is no place for heroic surgery'.

P. N. R.

ATHLETIC INJURIES—PREVENTION, DIAGNOSIS AND TREATMENT.—By A. Thorndike, Jr., M.D. 1938. Henry Kimpton, London. Pp. 208. Illustrated with 104 engravings. Price, 14s.

THIS small book should be of great value to any practitioner who is medical officer to an athletic club, school or university sports society, as he will find in a small compass information on practically all the injuries liable to occur during the playing of games.

Such information is otherwise only obtainable in books on general surgery or medicine and is therefore liable to lack the slight extra touch of practical experience in dealing with such injuries that this book provides.

It is divided into three parts. Part I (apart from chapter 1 which gives an outline of the development of the medical department of Harvard University in respect to athletics) is devoted to a brief but adequate outline of anatomy and physiology applied to athletics. This will be of particular value to the laymen associated with games, that is coaches, trainers and the athletes themselves. Part II deals with injuries and their treatment in general terms and part III is devoted to special injuries which should be useful to medical officers in enabling them to diagnose readily the signs of rupture of a small muscle for example, which they otherwise might fail to recognize. The special treatment for these conditions is also briefly and clearly outlined.

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This is a book that all medical officers to athletic organizations should possess, and it will also be found useful by many general practitioners because in these days when practically every man, woman and child, that is able to do so, takes part in strenuous exercise none of us know when he may be suddenly called upon to diagnose and treat an 'athletic injury'.

NEURO-OPHTHALMOLOGY.—By R. Lindsay Rea, B.Sc., M.D., M.Ch., F.R.C.S. 1938. William Heinemann (Medical Books), Limited, London. Pp. xxii plus 568. Illustrated with numerous text-figures and coloured plates. Price, 42s.

THIS book, consisting of 516 pages, has been produced by the author as one of moderate proportions to form a connecting link between ophthalmology and neurology.

The invention of the reflecting ophthalmoscope by von Helmholz in 1851 followed by the invention of the perimeter by Foster in 1857 opened up a new world with the result that the knowledge of the anatomy, physiology and pathology of the visual tracts has been gradually unfolded and so the ophthalmologist is provided with a means of giving valuable information and help to the neurologist. The contents of the book consist of 17 chapters on the equipment necessary for the examination of the eyes, the pupil and its reactions, the muscles and nerves of the eye and its adnexa, papillœdema, optic atrophy, the visual tracts and cortical representation of vision, the interpretation and location of lesions in the visual pathway as shown by the perimeter, the macula, the localizing value of ocular symptoms in the diagnosis of diseases of the brain, congenital and degeneration abnormalities and subarachnoid hæmorrhage, tumours of the optic nerve, the region of the optic chiasma and pituitary body, the ocular manifestations in diseases of the nervous system, affections of the vegetative nervous system, the ocular manifestations of head injuries, the poisons which affect vision and finally headache and amaurosis.

There is in addition an extensive bibliography which readers can consult for more detailed knowledge.

The book is well provided with excellent coloured drawings and illustrations. It is written in a clear, simple style. The author is to be congratulated on his work, which supplies a long-felt want in making much useful information in neurology available to the ophthalmologist and he has admirably succeeded in keeping his book to moderate proportions. To medical men in India who are interested in neuro-ophthalmology we strongly recommend this work.

E. O'G. K.

THE ADRENAL CORTEX AND INTERSEXUALITY.—By L. R. Broster, C. Allen, H. W. C. Vines, J. Patterson, A. W. Greenwood, G. F. Marrian and G. C. Butler. Chapman and Hall, Limited, 11, Henrietta Street, Covent Garden, W.C.2, London. Pp. xii plus 245. Price, 15s.

IT has long been recognized that some functional relationship exists between the adrenal cortex and the gonads, although the exact mechanism by which the clinical features of this connection are governed is obscure. The adreno-genital syndrome is essentially bisexual in nature and refers to the appearance of male secondary sex characters in the female with retrogression in the female sex characters. The authors have observed over one hundred of these cases; the case histories of many of them have been presented in this book, with illustrations.

The subject has been studied from clinical, surgical, pathological, psychological and biochemical points of view in collaboration with different experts, exhibiting a good example of team-work. Laborious research has led to the discovery of fuchsin-staining cells in the suprarenal cortex as evidence of virilism in women. An androgenic principle has been isolated from the urine of patients with the adreno-genital syndrome, and so also the adrenosterone or corticosterone, a crystalline sterol which is specific for virilism and is derived from the fuchsinophile cells in the cortex. Unilateral adrenalectomy has been performed in thirty-three cases for virilism, with one death due to post-operative shock. The operative results have been very striking; there is an early restoration of the menstruation, the male hairs are shed and the complexion improves.

The book begins with a foreword by Sir Walter Langdon-Brown and owes its existence to the generosity of Lord Wakefield of Hythe.

R. C.

A GUIDE TO HUMAN PARASITOLOGY FOR MEDICAL PRACTITIONERS.—By D. B. Blacklock, M.D. (Edin.), D.P.H. (Lond.), D.T.M. (Liverpool), and T. Southwell, D.Sc., Ph.D., A.R.C.Sc., F.Z.S., F.R.S.E. Third Edition. 1938. H. K. Lewis and Company, Limited, London. Pp. viii plus 259, with 2 coloured plates and 122 illustrations in the text. Price, 12s. 6d.

IT is only about two and a half years ago that the second edition of this book was reviewed in this journal. It must have been quickly exhausted for we note that it was reprinted in August 1936 and already a third edition has been called for. There is little need to recommend a book with such a record and we feel we cannot do better than quote from the opinion expressed in our review of the second edition as this edition has only been altered in one or two sections to bring it up to date, and our opinion has obviously been confirmed by the book's reception.

'To sum up, this book is the best the reviewer has seen for the use of a student when he has a teacher at his elbow. . . .'

TREATMENT IN GENERAL PRACTICE: THE MANAGEMENT OF SOME MAJOR MEDICAL DISORDERS. Second Edition. 1938. (Articles republished from the 'British Medical Journal'.) H. K. Lewis and Company, Limited, London. Pp. x plus 259. Price, 8s. 6d.

OUR readers' attention is drawn to the review of the first edition of this book in our October number, 1936. It is seldom that a book of this nature goes into a second edition or is even reprinted, but the immediate popularity of these already reprinted articles necessitated another reprinting within a year and a second edition a year later.

No changes have been made in many of the articles but in others a paragraph has been added here and there, *e.g.*, in the articles on new growths of the lung, scarlet fever, septicæmia, and congestive failure. In the last named, thyroidectomy and insulin treatment are discussed and details given for the drainage of œdema with Southey's tubes.

Whilst the few additions do not warrant the replacement of the first edition, we strongly recommend practitioners who have no copy of this valuable book to seize this unexpected opportunity and to purchase it.

PHYSIOLOGY OF THE CENTRAL NERVOUS SYSTEM AND SPECIAL SENSES.—By N. J. Vazifdar, L.M. & S., F.C.P.S., Captain, A.I.R.O. (Retd.). Seventh Edition. Revised and Enlarged. 1938. Popular Book Depot, Bombay, 7. Pp. 307 plus vii with 49 illustrations. Price, Rs. 5-4

DR. VAZIFDAR has achieved a great feat in compiling this book, and many medical students preparing for the examination will thank him for it. The present edition has been revised and enlarged keeping in view, however, the original character and scope of the book depicting an excellent outline of the anatomy and physiology of the nervous system and special senses based upon standard textbooks. There are many useful tables, and the book is illustrated by good line diagrams.

R. C.

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THE SHIP SURGEON'S HANDBOOK.—By B. J. Macaulay, M.D., L.R.C.P., L.R.C.S. 1938. John Wright and Sons, Limited, Bristol. Pp. 66. Price, 3s. 6d.

THIS is a very small book, little more than a pamphlet, which is not likely to be found of much value to a ship's surgeon, for it is doubtful if any doctor goes to sea without taking at least one or two good textbooks on medicine and surgery (if they are not supplied by the company as part of the dispensary equipment) which will give him much more information than this condensed booklet can hope to provide.

THE HISTORY OF THE FORCEPS: AN INVESTIGATION ON THE OCCURRENCE, EVOLUTION AND USE OF THE FORCEPS FROM PREHISTORIC TIMES TO THE PRESENT DAY (WITH A SUMMARY IN DANISH).—By V. Moller-Christensen. 1938. Oxford University Press, London, Humphrey Milford. Pp. xx plus 297. Illustrated. Price, 20s. Obtainable from Oxford University Press, Bombay and Calcutta

THIS book may be described by quoting the opening paragraphs of the author's summary.

'The present work contains an account of the history of the forceps. Standard terms are introduced for the various parts of the instrument and the technical features of its functions.

By means of detailed studies it has been possible for the writer to separate forceps into sharply defined groups and to form an opinion on the possibilities of using the various groups of the instrument.

Comparative investigations have enabled the writer to submit evidence that the European surgical forceps had its origin in Egypt, where, in the writer's opinion, the earliest forceps of about 3000 B.C. must be regarded as *surgical forceps*. In support of this hypothesis evidence is offered, *i.e.*, quotations from papyrus, which prove that the physicians of ancient Egypt used forceps'.

This volume is an interesting contribution in pure history and one cannot but admire the enthusiasm of the author which has led him to spend so much time and money on the production of a work that can bring him little pecuniary or material advantage.

THE ESSENTIALS OF MATERIA MEDICA PHARMACOLOGY AND THERAPEUTICS.—By R. H. Micks, M.D. (Dub.), F.R.C.P.I. Second Edition. 1938. J. and A. Churchill, Limited, London. Pp. xii plus 378. Price, 12s. 6d.

THE progress of pharmacology since the publication of the first edition of this book three years ago has not been of such a nature as to require drastic changes, but it has nevertheless been such as to necessitate modifying certain portions and rewriting certain chapters, to incorporate all the recent advances. A number of new drugs which have appeared during the last three years have been included and the author has been very wise in exercising a judicious caution in their selection. The sulphanilamide group of drugs which is still in an experimental stage has received adequate attention. The book has been well written and brings out with great clarity the really important actions and therapeutic uses of all drugs. It will be useful to medical practitioners and to students preparing for examination, as a handy book of reference.

R. N. C.

GLAISTER'S MEDICAL JURISPRUDENCE AND TOXICOLOGY.—Edited by John Glaister, M.D., D.Sc., Barrister-at-Law. Sixth Edition. 1938. E. and S. Livingstone, Edinburgh. Pp. xlii plus 747, with 107 illustrations and 8 plates. Price, 25s. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 17

THE excellent book is perhaps the most comprehensive one of this size on the subject. Space has been found even for war gases which 'have now become a menace to the civil population'.

Legal criminal procedure and medical evidence are dealt with in an interesting manner and more fully than is usually done in books on forensic medicine. Illustrative cases and references to original publications of medico-legal interest are plentiful. Regarding reconciliation of two different views, stated by eminent criminal judges, on the question of professional secrets of a medical man, however, the situation seems plainer to the reader than to the author. In differentiating between a knowledge of a comparatively trivial failing of human conduct, such as an unmarried mother's termination of her own pregnancy, and a knowledge of serious lawlessness, such as murder, there should not be much difficulty: and a medical man is not essentially a police detective.

Brash's procedure of identification of the skull, in the Ruxton case, by the aid of a known photograph, is an advance and so are the maggots in determining the age of the remains in which they may be found.

Comments may be made on the subject of blood. In the spectrum of hæmochromogen the band in the green does not appear to be broader than the band in the yellow in spite of diagrams to that effect in books. In dealing with heredity of blood groups von Dungern and Hirszfeld's theory may now be thrown overboard. Important information regarding heredity of M and N has not been included. Sutherland's technique of performing a precipitin test for detecting the source of blood has not been mentioned although a reference has been made to his 'exhaustive work on bloodstains'.

Nothing has been said for or against employing *x*-ray in the diagnosis of early pregnancy.

Only one error in spelling and one in printing arrest attention. On page 316 'Dungeon' should be 'Dungern' and on page 145 in the first line after *deaths* there should be a comma and not an apostrophe.

The author has not found it easy to use his pen on the manuscript of another. We, however, remember his association with the late Dr. Glaister in the last edition of the book.

The book should be on the desk of all medico-legal workers. Do students read works of this magnitude nowadays? If they do, they are decidedly tamer than they used to be, say, 20 years ago.

S. D. S. G.

A TEXTBOOK OF NEURO-RADIOLOGY.—By Cecil P. G. Wakeley, D.Sc., F.R.C.S., F.R.S.E., F.A.C.S., F.R.A.C.S. (Hon.), and Alexander Orley, M.D., D.M.R.E. 1938. Baillière, Tindall and Cox, London. Pp. xiv plus 336, with 229 illustrations. Price, 25s. Postage, 6d. Abroad extra

THIS volume deals with radiology of the skull and vertebral column with special reference to neurology and neuro-surgery.

Radiography of the skull is extremely well described and includes the special techniques for the accessory nasal sinuses and mastoids. It is rather surprising to find no mention of Graham Hodgson's technique in regard to the sinuses; the authors appear to favour American methods as exemplified by those of Granger.

The subject of radiology of the skull in relation to injuries is acquiring increased importance as a result of the appalling toll of the road. A very large proportion of the victims in motor accidents these days appear to suffer from skull injuries. It is sometimes exceedingly difficult in these cases to differentiate a linear fracture from normal skull markings. The authors have dealt with this part of the subject concisely but adequately. We think, however, that the necessity for stereoscopic radiography in many of these cases has not been sufficiently stressed.

The section on lesions of the cranium is extremely well done, and includes a valuable table of differential diagnosis embodying both clinical and radiological features.

The introduction within recent years of the methods of encephalography and ventriculography has led to a wealth of information regarding intracranial lesions

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The authors are to be congratulated on the able manner in which they have dealt with this part of the subject.

A whole chapter is devoted to cerebral arteriography. Opinions about the late effects of thorotrast are divided. The number of accidents have been described recently, and animal experiments have shown definite degenerative changes in the liver and spleen. It has also quite conclusively been shown that this material appears to be retained indefinitely in the reticulo-endothelial system causing a blockage of the cells here. The radio-activity of thorotrast retained in this way is also a matter which deserves serious consideration. We personally have not had the courage to advocate this method, though arteriography in other situations is quite easily done by the injection of per-abrodil or similar preparations.

The latter portion of the book deals with lesions of the spine and spinal cord with a last chapter on neuropathic disturbances. A very complete bibliography and index are provided.

A very welcome feature of this publication is the thorough manner in which the normal anatomy and appearances are treated before describing the variations from the normal.

We cannot speak too highly of the excellence of this work. It will be welcomed alike by the surgeon, neurologist and radiologist.

G. G.

THE PREPARATION OF SCIENTIFIC AND TECHNICAL PAPERS.—By Sam F. Trelease, Ph.D., and Emma S. Yule, Ph.D. Third Edition. 1936. Baillière, Tindall and Cox, London. Pp. 125. Price, 7s.

THIS manual is intended for the use of students who are writing articles on scientific or technical subjects. Many of the rules given are based upon recognized authorities, listed in the bibliography at the end of the volume. The book is short, lucid and practical. Anybody, going through it carefully, will learn how to avoid errors, how to present conclusions of his researches in a logical way and how to prepare manuscript and correct galley and page proofs for the printer.

R. C.

SYNOPSIS OF PHYSIOLOGY.—By N. J. Vazifdar, L.M. & S., F.C.P.S., Captain, A.I.R.O. (Retd.). Fourth Edition. 1938. Popular Book Depot, Bombay, 7. Pp. 729 plus xi, with 107 illustrations. Price, Rs. 7-8

THE appearance of the fourth edition of the *Synopsis of Physiology* by Dr. Vazifdar shows its popularity and growing demand. The book has been revised, enlarged and brought up to date. It is a useful compilation in a condensed form, which will serve as a guide for students to revise the subject quickly while preparing for examinations. Certain sections, for instance, that on the nervous system which is very good, have been dealt with in a systematic manner, while the rest of the book refers to various important physiological principles. Brevity being the key-note of the book, a few sections are rather inadequate; this, it is hoped, will receive due attention in the next edition. The usefulness of the book is greatly enhanced by 107 illustrations, many of which are original.

R. C.

ILLUSTRATIONS OF ANATOMY FOR NURSES.—By E. B. Jamieson, M.D. 1938. E. and S. Livingstone, Edinburgh. 62 Plates. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 5

THIS is a selection from the second edition of *Illustrations of Regional Anatomy* by the same author. It includes 62 plates which, with the exception of four, are identical with those in the above publication. It is bound in the same handy loose leaf method so that any plate may be removed and used under an epidiascope for illustrating a special lecture.

It should be extremely valuable to teachers of anatomy to nurses, for whom it has been produced.

P. A. M.

OTHER BOOKS RECEIVED

The Evolution of Chronic Rheumatism with Treatment to Correspond—The Preventive Clinic as a First Line of Defence.—By R. F. Fox, M.D. (Lond.), F.R.C.P. 1938. H. K. Lewis and Company, Limited, London. Pp. 26, with 5 text-figures. Price, 2*s.* 6*d.*

THIS is a reprint of a lecture, delivered at Margate, at the Congress of the Royal Institute of Public Health and The Institute of Hygiene, May 1937, which has already been published in the *Journal of the Royal Institute of Public Health and Hygiene.*

For those who are interested in the subject of establishing rheumatism clinics, it is convenient to be able to obtain copies in pamphlet form.

The Use of Quinine in Obstetrics.—By Dr. H. P. A. Smit. 1938. Cinchona Instituut. Bureau Tot bevordering Van Het Kinine-Gebruik. V. Limburg Stirumstraat 43. Postbus 215, Amsterdam-W. Pp. 20.

THIS is a pamphlet issued by the Cinchona Institute, Amsterdam; its scope is as the title implies. It emphasizes the fact that quinine is *not* an abortifacient, but is a useful prophylactic.

Abstracts from Reports

TUBERCULOSIS IN THE RURAL DISTRICTS OF THE EAST. (FROM THE REPORT OF THE PREPARATORY COMMISSION, HEALTH ORGANIZATION OF THE LEAGUE OF NATIONS, BULL. INT. UNION AGAINST TUBERCULOSIS, 1937)

FOR the last ten years attention has often been drawn to the increase in the frequency of tuberculosis in the Far East. However, Japan is the only country for which there are accurate statistical data, as elsewhere only estimations and tentative enquiries have been made. In the list of the causes of death, twenty years ago, tuberculosis occupied the sixth or seventh place. To-day, in a number of eastern countries, it comes third; in Japan tuberculosis comes second and in the Philippines this disease even heads the list.

Obviously, this does not mean that the incidence of tuberculosis has increased, in absolute figures. Improved prophylaxis with regard to diseases such as smallpox, cholera, malaria and typhoid has resulted in a lesser death rate from these infections, so that tuberculosis has become conspicuous. Another cause for this relatively increased incidence is to be found in better diagnostic methods and a more accurate recognition of the various forms of the disease. For instance, tuberculosis of infants and children, which was formerly supposed to be uncommon in Asia, is, in fact, fairly widespread.

In several countries, enquiries have been made in order to determine more accurately the incidence of latent and manifest cases of tuberculosis, as well as the modes of infection. These enquiries, which are difficult to carry out, have been so far fragmentary and do not justify any general statement, nor a comparison with the data collected in Europe. One gets from them a definite impression that in a number of countries tuberculosis is already one of the most

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widespread social diseases and that its extension to vast and relatively unaffected rural areas constitutes one of the most serious and urgent public health problems in Asia.

In order to institute a logical anti-tuberculosis scheme, with special regard to the protection of uncontaminated or scarcely contaminated areas, it is necessary to be acquainted with the state of affairs not merely in each country but in each province and to consider separately the cities and the rural districts, as well as, among the latter, those who supply industrial or agricultural labour and those who do not. To seek to apply the same measures against the spread of tuberculosis in uninfected rural areas, against its pseudo-epidemic dissemination in a recently infected environment, or against endemic tuberculosis in the cities would be as nonsensical as to institute, against malaria, the same anti-larval measures in deltaic, mountainous or urban districts.

In order to find out to what extent the populations are infected, one may use the statistics of the causes of death, but it will be necessary, by means of tentative enquiries (through careful retrospective interrogations among rural families, or by a series of autopsies in the cities), to determine the probable margin of error above or below existing figures which are based on the diagnosis of incompetent village chiefs or of registration clerks.

It will be particularly advisable to find out the rate of positive tuberculin reactions among respective samples of the rural and urban population, and to make a clinical and, if possible, an *x*-ray examination of these cases.

If one wishes to obtain comparable results between different regions one should adopt a uniform and accurate tuberculin test technique as well as a standard tuberculin, either that recommended by the Permanent Commission of Biological Standards of the Health Organization, or a tuberculin prepared on a purified synthetic medium.

The data thus obtained and the complementary epidemiological enquiries will enable one to determine whether the population under investigation is or is not tuberculized and, in the first case, at what age and under what conditions tuberculization occurred. This knowledge will serve as a basis for the adoption of practical measures of prophylaxis.

The problem under consideration is not to make a choice between the artificial pneumothorax, gold salts or simple sanatorium cure in the treatment of manifest cases but to define and apply a prevention policy which will meet simultaneously the epidemiological situation and budgetary resources.

One may consider that it is actually useful to educate the people—school children and adults—with regard to public health, to the modes of infection of tuberculosis, to the best feeding and living conditions likely to increase their resistance; but this education must be perfectly adapted to local conditions and not be a mere modification of the public health propaganda suitable for the inhabitants of Western Europe or the United States of America.

With regard to poor and ill-nourished populations for whom an improved standard of living and therefore an increased resistance can only be foretold in the distant future, specific protection through vaccination is particularly important.

To this date, in Asia, B. C. G. has been systematically used only in Indo-China. The conference should be able to know the results of B. C. G. vaccination in that country in order to decide whether its use can be recommended in other countries. There, again, a logical adaptation will be necessary: quite justifiably, in heavily infected French, Rumanian and Indo-Chinese cities, B. C. G. is inoculated to newborn children as this vaccine, to be efficient, must be given previous to any tuberculosis infection, and the latter may take place early when the disease is endemic. Likewise, in heavily infected eastern cities, B. C. G. ought to be given to newborn babies. But this does not apply to practically uninfected regions where only a few individuals have become tuberculous while staying in the cities where they had been employed.

It is on their arrival in the towns or in industrial areas that one ought to vaccinate uninfected rural workers; through whom one will thus protect indirectly the villages where they will return some day with their savings.

While general subcutaneous vaccination of tuberculin-negative cases is justified in areas where tuberculosis is spreading, there is evidently no advantage in vaccinating children in uninfected rural areas which are but little exposed to infection. In fact, in the absence of exogenous reinfections which keep up the immunity conferred by B. C. G. vaccination, this immunity would progressively subside until its ultimate disappearance.

Adaptation to local conditions is no less indispensable if one considers the institutional treatment of the tuberculous. In cities where tuberculosis is endemic and where fibrous forms are common, the campaign may be organized through the dispensaries where artificial pneumothorax can be applied and through sanatoriums where the rest and education cure can be started, and even completed when the necessary resources are available.

But in areas where tuberculosis is spreading and where cases of massive caseification are common, one must provide in the first place for the isolation rather than for the treatment of patients and for the protection of healthy subjects through vaccination or any other method.

A mere imitation of the tuberculosis organization schemes of European countries with their network of dispensaries, hospitals and sanatoriums, would lead to a wasting of public funds, as it would necessarily be incomplete, owing to lack of adequate resources; moreover it would not meet the particular needs of oriental populations.

A preventive measure which seems everywhere imperative is the control of individuals belonging to professions involving special risks with regard to the spread of bacilli; this remark applies chiefly to the teachers.

As far as one knows, bovine tuberculosis is not common in Asiatic countries, so that it need not be taken into account in the organization of the campaign against tuberculosis.

PAPWORTH VILLAGE SETTLEMENT (DIRECTOR'S REPORT, 1936, SUBMITTED TO THE ANNUAL MEETING OF THE INTERNATIONAL UNION AGAINST TUBERCULOSIS, LISBON, 1937)

THE Director of Papworth in his annual report usually takes some particular aspect of the tuberculosis problem for discussion with which to preface his report. This report which was recently published takes the question of prolonged treatment and its relation to Papworth and normal industry.

Defining the desired results of treatment to be a restoration of working and earning capacity in the outside world for the tuberculous patient, the question is asked as to what is to be done for those men and women who must work for their living, and who, as a result of prolonged absence from work owing to prolonged treatment, are not able to secure a position in industry. The question is whether normal industrial concerns are going to revise their regulations and take in tuberculous workers or whether some scheme will be set up for their benefit.

Attention is drawn to the criticism that Papworth is too small to benefit the total tuberculous population of the country; and it is shown that Papworth was designed as a demonstration to show that substandard men and women could succeed in earning their living and maintaining the beneficial effects of treatment in such sheltered conditions.

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It is for normal industry to shoulder the burden now that it has been shown to be possible in sheltered conditions; and if normal industry is unable to meet this obligation they must consent to co-operate in the establishment of similar undertakings to the Papworth scheme for substandard labour.

The development of the treatment centres of Papworth is remarkable because so many people tend to regard the scheme as solely industrial and to forget that there are three modern hospitals with a chain of seven medical units as ancillary departments: dental, ophthalmic, ear, nose and throat, orthopædic, collapse-therapy and radiology. There is, in addition, a fully equipped series of research departments devoted to pathology, biochemistry and physiology respectively. The report is printed at Papworth with illustrations and bibliography of all publications during the course of the year; and if any members of the Union request a copy they will receive one as soon as possible.

The records show that one-third of the settlers have been steadily employed for ten years and over; and another third for five to ten years.

AFTER-CARE AND REHABILITATION (PRINCIPLES AND PRACTICE). By E. BRIEGER. (FROM THE REPORT PRESENTED TO THE CONFERENCE OF THE INTERNATIONAL UNION AGAINST TUBERCULOSIS, LISBON, 1937)

THIS report, issued by the committee for after-care and rehabilitation of the International Union, gives a full and comprehensive account of many schemes in different countries. As is mentioned in the introduction to the report, the highest measure of success can be attained only when three fundamental aspects of the work—care (dispensaries), treatment (sanatoria) and after-care—are so organized that harmonious co-operation between them is secured. There are three parts to the report: the first dealing with prognosis and after-care, the second with social rehabilitation, and the third with the multiple unit for institutional care and after-care.

No criticism of any kind can be laid against the thorough method employed by the compiler (Dr. Brieger) in his treatment of the three essential sections of his work. In his general conclusions Dr. Brieger says that complete recovery depends mainly on the maintenance of such conditions as enable the benefits of treatment to be retained, and that the restoration of the working capacity of the tuberculous is supposedly the ultimate objective of all measures for care and treatment. Rightly also he emphasizes that organized rehabilitation and re-employment of the tuberculous are important, not only for the well-being of the tuberculous worker but also for the economic well-being of the community at large. The economic value of the substandard worker can only be assessed by his employment in industry where his physical and economic efficiency can be controlled by continuous clinical care. The recovered case may be able to achieve a degree of stabilization which will allow return to work in normal industry. Sheltered occupation is most necessary for those who constitute what is known as 'middle stage' cases; from their physical condition they are unemployable in ordinary industry. It is for this latter group that industrial settlements like Papworth and Preston Hall have been developed and which give to the tuberculous man or woman a smooth path through all the various phases of medical, social and industrial convalescence.

The report is, of course, a strong plea for the village settlement conception, but it is to be regretted that certain of the criticisms which have been laid at the door of village settlements have not been answered as thoroughly as might have been the case. Nor is there reference in any detail—and their accomplishments deserve some detailed description—of the many care and after-care committees in England, Canada, and the United States of America which have done much to administer to the medical and social needs of thousands of patients for whom the village settlement is not more than a dream which can never come true. Although the report does not state specifically that village settlements are the solution to the entire tuberculosis problem, this view is implied in many of the pages, and there are few indeed who would subscribe to this opinion. That the village settlement is important and useful is not to be denied, but in a report which deals with after-care as well as rehabilitation it might have been well to mention the limitations of village settlements as well as to praise them.

Altogether this report provides a useful account of many schemes for rehabilitation, contains a valuable bibliography of the subject and is an important contribution to one aspect of care and after-care.

KING EDWARD VII SANATORIUM, BHOWALI, U. P. ANNUAL REPORT FOR 1937

ON 1st January, 1913, there was accommodation available for 18 patients only; this was raised to 47 during the same year. Since then there has been a gradual increase in the accommodation with the result that 54 beds were available in 1920, 98 beds in 1930 and 122 beds in 1936. A further addition of 20 beds was made in the year 1937.

The following improvements were brought about during the year under report:—

Nursing arrangements.—These were markedly improved. The strength of the nurses was raised to twelve—six female and six male. Nursing forms the backbone of the treatment in a disease like tuberculosis. Proper nursing arrangements in the sanatorium were long overdue.

The female nurses home has been remodelled and improved. There are six suites of rooms, each nurse getting a suite consisting of a bedroom with glazed verandah in front and privy and bathroom behind. No attendants are allowed to stay with the female nurses who are looked after by the nursing superintendent. Food is provided from a common mess for which a cook has been provided from the sanatorium.

The male nurses home has also been remodelled and each male nurse is provided with a suite of rooms. Male nurses are allowed to keep their families as they have to make their own arrangements for board.

Arrangements have been made in this block for the accommodation of four patients. No arrangements existed in the sanatorium till now for the proper nursing and treatment of serious complications. All such cases will henceforth be brought together in one place in order to facilitate their nursing and treatment.

The addition of a ward-boy's room to the Red Cross block will enable a ward-boy to be available throughout day and night for the patients occupying this block.

A recreation hall has been constructed at a cost of Rs. 11,000 out of which Rs. 4,000 was provided from the Silver Jubilee Fund. The hall is a magnificent structure capable of holding a large audience and has been particularly designed to serve the needs of the patients. The recreation hall is a great acquisition to the sanatorium and is centrally situated. The sanatorium now possesses separate recreation halls for the use of male and female patients.

Owing to the construction of the recreation hall in its proximity, the carpenter's workshop became unsuitable for its purpose on its present site. It was, therefore, converted into a comfortable guest house where visitors to the sanatorium could be received. The guest house can accommodate three visitors at a time. No proper arrangements for the reception of guests and visitors existed in the sanatorium before.

The road has been improved so that motor cars can now be driven right up to the administrative building. The presence of a motorable road will be a source of great convenience to the patients who can drive right up to the sanatorium office instead of waiting for the 'dandy' at the gate.

Dr. Y. G. Shrikhande was appointed Medical Superintendent from 16th January, 1937, and Dr. D. N. Sanyal and Dr. M. Zubair were appointed Senior and Junior Assistants to the Superintendent respectively from the same date.

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The importance of amusement and recreation in the treatment of pulmonary tuberculosis is acknowledged by all who are entitled to speak on the subject. Everything that tends to take their minds off their complaint is a definite aid to treatment of patients and should be utilized to the full. With this object in view a number of social events and recreative diversions are arranged in the sanatorium from time to time.

There is a radio set to enable the patients to enjoy the daily programmes of different places.

A small cinema machine has very kindly been presented by the Right Hon'ble Sir Tej Bahadur Sapru and patients are entertained with small films from time to time.

An American optical lantern has been presented by Rai Rajeshwar Bali Saheb, Taluqdar of Dariabad, and instructive slides on diseases like cholera, plague, typhoid, etc., are shown to the patients.

The sanatorium possesses a fairly good general library containing books on various subjects in Hindi, Urdu and English. The library is used freely by the patients. The sanatorium also subscribes to several newspapers and illustrated journals and periodicals for the use of the patients, and is very lucky in getting free copies of the *Statesman,* the *Pioneer,* the *Illustrated Weekly of India* and the illustrated weekly edition of the *Leader* and our thanks are due to the Editors of these papers. The Horlick's Malted Milk Co., Ltd., are supplying free copies of the *Sphere, Strand,* and *Tit Bits* for some years and we are very grateful to them for this generous gift.

The Virol agents gave one dozen bottles of Virol; the Bovril gave one dozen bottles of Bovril; and the Horlick's Malted Milk gave three dozen tins of the milk and one dozen mixers. These preparations were distributed to the poor patients and the sanatorium is very grateful to the manufacturers for their generous gifts.

The sanatorium was visited by the Hon'ble Sir S. M. Sulaiman, President of the Sanatorium Trust Committee, on 26th June, 1936. As he has been appointed a Judge of the Federal Court of India, this was his last visit to the sanatorium and he took the opportunity of visiting almost all the cottages and wards and bidding good-bye to the patients.

The Hon'ble Sir J. P. Srivastava, *interim* Finance Minister, visited the sanatorium to select a suitable site for the construction of a block of six rooms for female patients which he proposes to donate to the institution.

The sanatorium was visited by the Hon'ble Pandit Govind Ballabh Pant, Premier of U. P., on 9th October, 1937, when he went round and saw different wards and cottages and the newly constructed recreation hall. He advised the patients not to take part in politics as long as they were patients but to concentrate on getting well soon in order to make room for other deserving cases. He also announced that Government would be pleased to grant money towards the improvement of the recreation hall.

The sanatorium was also visited during the year by Dr. W. Burridge, Professor of Physiology, Medical College, Lucknow, and Dr. B. K. Sikand, Organizing Secretary of the King George Thanksgiving Fund.

The sanatorium was officially inspected by Colonel J. A. S. Phillips, C.I.E., V.H.S., D.P.H., I.M.S., Inspector-General of Civil Hospitals, U. P., on 11th June, 1937.

The committee meets twice annually—the winter meeting being held in Allahabad and the summer meeting in Bhowali. The meeting at Allahabad was held on 16th January, 1937, and at Bhowali on 26th June, 1937. The Hon'ble Sir S. M. Sulaiman presided over both the meetings.

An extraordinary meeting was convened in Allahabad on 13th November, 1937, in order to consider the amendments necessary in the constitution of the Sanatorium Trust Committee in view of the changes brought about by the Reforms Act of 1935. The Hon'ble Mr. Niamat Ullah, Acting Chief Justice of the Allahabad High Court, presided over the meeting.

The finances of the sanatorium remained satisfactory. The three main sources of income are:—

1. Interest on Endowment Fund amounting roughly to Rs. 14,000.

2. Annual grant-in-aid from the Government of Rs. 17,000.

3. Income from fees realized from paying patients, which amounted during 1936–37 to Rs. 40,995.

The pressing needs of the sanatorium at the present moment are:—

(1) Electrification of the sanatorium.

(2) A 'talkie' equipment for the recreation of the patients.

GOVERNMENT TUBERCULOSIS CLINIC (COLVIN HOSPITAL), ALLAHABAD, U. P. FIRST TRIENNIAL REPORT

THE Government Tuberculosis Clinic at Allahabad, which started functioning from August 1936, under Dr. R. N. Tandon, has been founded by the Government of U. P. on a provincial basis in the premises of the Colvin Hospital, with modern equipment including an *x*-ray plant for up-to-date treatment of pulmonary tuberculosis. A new block has been erected for the outdoor section of the clinic and one ward of the Colvin Hospital has been vacated for indoor patients in indigent circumstances suffering from the disease. Amongst its staff are three health visitors, who go to the homes of people to detect patients, bring contacts, and carry on propaganda among them.

ANTI-TUBERCULOSIS WORK IN CHINA. BY G. F. BUME, M.D., ASSISTANT PROFESSOR OF MEDICINE, AND CHIEF OF THE TUBERCULOSIS SECTION OF THE NATIONAL MEDICAL COLLEGE OF SHANGHAI. (QUOTED FROM THE BULLETIN OF THE INTERNATIONAL UNION AGAINST TUBERCULOSIS, APRIL 1937)

IN most countries with a western civilization the campaign against tuberculosis has been associated with the development of modern methods of diagnosis and treatment: roentgenology, surgery, pathology, immunology, etc. This campaign, moreover, has been intimately connected with the institution of dispensaries and sanatoria which were at first subsidized by private initiative before the whole movement was taken up by the state and assumed its present and scientific position.

In China, a consciousness of the necessity of organized anti-tuberculosis work is gradually gaining ground and it is to be hoped that this country, as a result of the experience acquired by other nations, will be spared the phase of unorganized private endeavour which, to a certain extent, has held up the growth of the movement in many communities. As a member of the Chinese Medical Association, the leading medical organization in the country, I may bear witness to the earnest attention with which my colleagues consider this problem.

Actually, anti-tuberculosis work is faced in China with worse difficulties than in any other part of the world. First of all the size of the country is an obstacle to all attempts at establishing a central administration; yet it must be admitted that the influence of the Nanking government is steadily spreading every year to the remotest provinces and cities, as they are made less inaccessible through the development of roads and air traffic. Whether improved transport facilities have a tendency to favour the spread of the disease is a moot point; in the author's opinion there is no region in China where tuberculosis is not one of the most widely distributed diseases. Furthermore, the isolation of the various regions has never been such as to constitute a barrier against the spread of infection.

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A further difficulty in any attempt to control tuberculosis is the absence or inaccuracy of statistics of the birth rate and death rate. Cities like Nanking, Peiping, Shanghai, Hong-Kong and a few others are an exception to this rule. The reason for this state of affairs is twofold: the influence of the old-fashioned *heb*-doctor is by no means extinct; moreover, in districts which own a public health department under the control of the central, provincial or municipal authority, the powers of this department are too limited to enforce the compulsory notification of infectious diseases. However, it cannot be denied that conditions are constantly improving; the Chinese Medical Association is taking a leading part in this progress. In 1933 a National Anti-tuberculosis Association was organized under the sponsorship of the Mayor of Greater Shanghai, General Wu Teh-chen, with a threefold object; to carry out a public health education programme, to raise the necessary funds for the campaign against tuberculosis, and to organize this campaign on a large scale. Since that date the National Anti-Tuberculosis Association has opened three tuberculosis clinics in the city of Shanghai; a sanatorium of 500 beds for all categories of patients is being built and affiliated committees are being organized in several provinces.

The rather indifferent attitude of some authorities with regard to tuberculosis can be understood to a certain extent. While decisive progress has been made with regard to acute infectious diseases, nothing is done for tuberculosis. This is due to the fact that the acute infections, such as typhoid, cholera, dysentery, smallpox, etc., can be controlled at much less cost and with spectacular results which impress the yet rather sceptical population. While tuberculosis constitutes such a huge problem, any measures in this direction are bound to be immediately expensive and effective only in the remote future. Phthisiologists disapprove of this attitude on the part of the authorities, although they can understand their point of view. They feel that something must be done if China is to retain its place in the circle of civilized nations. Private initiative has been responsible for whatever results have been obtained so far. It is now felt that some central authority should take the lead, for instance, the public health department of the Nanking government, who should pass a Tuberculosis Act and grant a financial subsidy. The moral support and the uniform direction of the tuberculosis movement throughout the country resulting from such a step would be of far greater importance than the financial assistance, which, for obvious reasons, can only be limited but would nevertheless constitute an official token of approval.

Very little can be said about the causes for the increased death rate in Hong-Kong and the decline in Peiping; in countries with more ancient and perhaps more reliable statistics opinions are divided about the causes of the general decline of the tuberculosis death rate. Yet it is a fact that during the period covered industrialization made great progress in this city. Furthermore, during the year 1927, large sections of the population emigrated after Peiping had been deprived of its dignity as the capital of the Empire and after the Kuomingtang had become established at Nanking. Whether industrialization may really be held responsible for the increased death rate at Hong-Kong or the diminished density of the population for the decline observed in Peiping remains to be proven. With regard to Peiping it is at least questionable whether the rapid decrease in the density of the population could have brought about in such a short time so considerable a decline in the tuberculosis death rate.

The results of the tuberculin tests carried out among various groups of the Chinese population are not of equal value. The figures published by Korns are so much below those of other authors that one can hardly explain the discrepancy otherwise than by a possible error of technique. An investigation of 1,007 *x*-ray films of young Chinese adults by Hall and Chang, in Peiping, the city where Korns carried out his test, yielded a proportion of radiological signs of early infection of 71.5 per cent. This compares well with the findings of Lai, Kao and Chien as the result of their tuberculin tests in the same age-groups. If one considers the frequency of latent lesions which cannot be detected by the *x*-rays although they give rise to a positive tuberculin reaction, the findings of Hall and Chang would indicate that the percentage of positive tuberculin reactors in Peiping, in the age-groups in question, would be somewhat higher than the number of positive *x*-ray results. Korn's report must therefore be accepted *cum grano salis*. With regard to the data of Bume and Liu the figure of 200 cases is too small to be conclusive. This experiment includes all age-groups over 14 and was carried out among hospital patients of all kinds, ruling out cases with active tuberculous lesions, whether pulmonary or surgical. The work of Lai, Kao and Chien is by far the most interesting and elaborate of this series because it includes the greater number of tests and is well drawn up with regard to age-groups and to sex. As far as tuberculin tests are concerned, it must be considered the standard work for China.

The reports of Anderson and Wylie are of interest chiefly because, although they deal with different parts of China, their percentage of positive reactors is almost identical in the respective age-groups with that of Lai, Kao and Chien, although Wylie's material is much smaller, while the number of Anderson's cases is unknown.

In a country with an area of 4,008,200 sq. km. and a population of 406,191,653 inhabitants, which corresponds to an average density of 101 per sq. km., tuberculosis workers are obviously faced with a fantastic problem, the complexity of which is increased by the fact that some areas like the large cities are much more densely populated, while in the rural districts and smaller towns conditions are quite different. In comparing an urban series with that of a small country town, Lai, Kao and Chien found a much smaller percentage of positive tuberculin reactions in the latter as compared with the population of the business centre of Shanghai.

The difficulties of tuberculosis work are made worse by certain peculiarities of the orientals, for instance, their widespread habit of spitting. In public places, in the theatre, in the street and at home anyone may spit where and whenever he likes without committing a breach of good manners and without giving rise to any objection on the part of his neighbours. One must also mention the patriarchal custom according to which all persons eat at the same table and help themselves with their chop-sticks out of the common bowls of food, while it is considered polite to serve your neighbours with your own chop-sticks. If one remembers the enormous density of population in the large cities and in some villages it will be readily understood that people live and sleep very near one another and that it probably rarely happens that one person, whether healthy or sick, can sleep alone in a bedroom.

Our tuberculosis dispensaries are yet too young to have gathered enough material to prove this point, but thanks to our files and registration forms we hope to be able to do so in the near future. Many authors underestimate the possibility of infection through tubercle bacilli included in dried sputum scattered by wind. It may be permitted to report here the results of an investigation carried out at the request of the National Anti-tuberculosis Association of China. Specimens of sputum collected in the streets, cinemas, theatres, etc., of Shanghai were examined by my assistants: out of a first series of 100 specimens collected in 100 different areas, without the help of concentration methods, cultures or inoculation into the guinea-pig, merely through the ordinary Ziehl-Neelsen staining process, they were able to identify turbercle bacilli in 16 instances. While these figures are too small to enable one to draw definite conclusions yet the percentage of 16 is very striking; should further

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researches corroborate these findings the question of infected sputum must be taken into serious consideration when discussing the spread of the disease and its prevention in Chinese cities. Whether, however, dried sputum contains living and virulent bacilli which are a potential source of infection, or whether the bacilli are dead or attenuated and thereby susceptible of giving rise to allergy and to a certain degree of immunity, is open to question and may lead to further interesting investigations.

The housing and food problems are of yet more vital importance.

A very strong feeling of mutual responsibility exists between the members of a family or clan, even in modern China, based probably to a certain extent on the worship of ancestors. One frequently finds that a man who is out of work is kept by his brother or nephew with his wife and all his children; this occurs in all classes of the population and naturally leads to excessive overcrowding of houses, flats and single rooms and to considerable impairment of the economic status of otherwise fairly well-to-do families. The same living conditions are observed among small craftsmen and shopkeepers as well as in the minor factories where the apprentices and younger employees sleep in overcrowded and unventilated dormitories and eat at a common table in the manner we have described. Board and lodging is, in fact, the only remuneration the younger working man most commonly receives in compensation for his services.

Under these conditions the circle of persons exposed to the risk of infection from contact with an open case of tuberculosis is immensely enlarged. That this must necessarily involve widespread infection and a thorough epidemiological distribution of the disease is obvious. But, whether in consequence of this fact the amount of active disease is relatively higher in China than in other countries has not been conclusively settled. It is at least possible that owing to the ubiquity of the bacillus imperceptible infections may occur and give rise to a certain degree of immunity. The relatively good resistance to the disease noted by Hall and Chang and observed by the writer, at least in some parts of the country, would corroborate this theory.

While, on the one hand, family and working conditions may favour the spread of tuberculosis in China, on the other, the sense of mutual responsibility already alluded to between the members of a family or clan is often a great help to the dispensary and to the visiting nurse. The problem of sanatorium beds is very urgent; sickness insurance does not exist and there is no legal provision for the support of a patient by the local authorities. In case of need, however, a near or distant relative can always be found, who, abiding by an unwritten law, assumes responsibility for the cost of the patient's treatment in a sanatorium or hospital. It may happen that a patient is unwilling to confront his uncle or nephew with a demand for funds. A routine enquiry is therefore made by the dispensary into the financial condition of relatives and, when this seems necessary or advisable, the nurse acts as a mediator between a destitute patient and his wealthier connections.

This method, which is intended to make up to a certain extent for the absence of sickness insurance, was carried out for the first time, with a fair measure of success, by the tuberculosis division of the first hospital of the Red Cross Society of China in Shanghai.

Health education obviously plays a considerable part in the tuberculosis campaign in China. Here again one has to face tremendous difficulties, in the first place the illiteracy of most of the rural population; to this day, anti-tuberculosis work has hardly proceeded as far as the rural districts. In some parts of the large cities, especially on their outskirts, conditions are, in many ways, similar to those in country, towns and districts. Floods and famines at times drive the country population in great masses to the large cities where they live in narrow, self-built straw huts outside the living quarters of the city dwellers. The inhabitants of these temporary, unregistered huts, as well as other sections of the illiterate population, are difficult to control as, apart from other drawbacks, they do not trust western civilization nor its sanitary methods. The same remark applies to the large section of the populace who have no permanent domicile but spend their whole life on boats, earning their living by transporting goods in their craft, along the numerous creeks which are formed by the Yantze-Delta and along the ramifications of this river which extend into remote regions in the interior.

In accordance with the method adopted by Stampar under similar conditions in Yugoslavia it is proposed to send among these classes of the population travelling health instructors who will try and explain the dangers of tuberculosis and how they may be avoided by personal talks, lectures, pictures and cartoons adapted to the Chinese mentality. Before it is possible to penetrate into these lowest strata of society, however, an enormous amount of work will have to be done which will involve considerable expense.

There is yet a long way to go before we are in a position to exert a definite influence on the death rate, especially as in China, to a greater extent perhaps than in any other country, tuberculosis is a social and economic, rather than a medical, problem. There is no reason to be too pessimistic and it is a matter of great satisfaction to know that the Chinese Medical Association has appointed a Tuberculosis Committee which will investigate into the ways and means of unifying anti-tuberculosis activities throughout the country. One of the first steps taken by this committee to which I have the honour to belong has been to discuss tuberculosis teaching in the medical schools; a report to this effect has been forwarded to the educational authorities. In this report the committee advocates that tuberculosis be recognized as a special subject on an equal standing with pediatrics, dermatology, neurology, etc., that the medical curriculum be made to include lectures on this subject, and that post-graduate courses in tuberculosis be instituted. For several years post-graduate courses in tuberculosis have been held by the author and his assistants in the Division of Pulmonary Tuberculosis of the National Medical College of Shanghai.

If one considers the apparently unsurmountable difficulties which have to be met, the activities of the National Anti-tuberculosis Association of China will be better appreciated. Excellent work is being done in the three dispensaries established and subsidized by the association, in different districts of the city of Shanghai, as will be seen from the first report to be published shortly. Although it has only been in existence three years the association has been able, not only to create and to maintain these dispensaries, but to provide for the construction of a large sanatorium. Its Patron, General Wu Teh-chen, and its President, Mr. Loh Pa-hung, deserve our congratulations for their energy and skill.

Service Notes

APPOINTMENTS AND TRANSFERS

BREVET-COLONEL B. C. ASHTON to be Officiating D. D. M. O. W., Army Headquarters. Dated 30th July, 1938.

Lieutenant-Colonel J. E. Ainsley is reverted to the Military employment and posted as Second in Command, Indian Military Hospital, Nowshera.

Lieutenant-Colonel N. K. Bal on return from leave to rejoin appointment as District Medical Officer, Superintendent, Government Headquarters Hospital,

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and Medical Officer, Central Jail, Trichinopoly, *vice* Sri U. Anantayya.

Lieutenant-Colonel B. Sahai to be O. C., C. I. M. H., Fort Sandeman. Dated 28th June, 1938.

Lieutenant-Colonel T. R. Khanna to be O. C., C. I. M. H., Loralai. Dated 28th June, 1938.

Lieutenant-Colonel R. A. Warters to be O. C., C. I. M. H., Bannu. Dated 16th July, 1938.

Lieutenant-Colonel R. L. Vance to be Officiating A. D. M. S., Waziristan District. Dated 13th July, 1938.

Subject to the approval of the Secretary of State for India to the transfer of Major A. N. Chopra, that officer is appointed as a leave reserve officer under the Central Government and is posted temporarily as Additional Assistant Director-General, Indian Medical Service, with effect from the 1st April, 1938.

Major E. S. S. Lucas on return from leave to be Civil Surgeon, Agra.

Major D. P. Lambert transferred from Fyzabad to Meerut, *vice* Major C. V. Falvey.

Major C. V. Falvey transferred from Meerut to Bareilly, *vice* Major M. R. Sinclair.

Major P. J. Kelly to be District Medical Officer, with effect from the 24th June, 1937.

On return from leave, the services of Major H. W. Mulligan, an officer of the Medical Research Department, are placed at the disposal of the Government of Madras for appointment as Director, Pasteur Institute, Coonoor, with effect from the 5th July, 1938.

The services of Major M. L. Ahuja, an officer of the Medical Research Department, are placed at the disposal of the Government of Assam for appointment as Officiating Director, Pasteur Institute and Medical Research Institute, Shillong, with effect from the 30th June, 1938.

Major Gerard Kelly, First Resident Medical Officer, Presidency General Hospital, Calcutta, is appointed to act as Professor of Clinical Medicine, Medical College, Calcutta, *vice* Dr. M. N. De.

Transferred to civil employment

Major J. Singh on 12th July, 1938, to the Medical Research Department.

Subject to the approval of the Secretary of State for India to the transfer of Major S. S. Bhatnagar to the Civil Branch of the Indian Medical Service, that officer is appointed to the Medical Research Department on probation, for 2 years, with effect from the afternoon of the 26th June, 1938, and is posted as Officiating Assistant Director, Central Research Institute, Kasauli.

Captain M. Sendak, whose services have been placed at the disposal of the Government of the C. P. and Berar, is attached to the office of the Civil Surgeon, Nagpur, for training at the Mayo Hospital and Central Jail, Nagpur, from 30th July, 1938.

Captain Sangham Lal to be District Medical Officer, with effect from the 14th November, 1934.

Captain B. J. Griffiths transferred from Agra to Allahabad.

Captain F. W. Allinson, Civil Surgeon, Midnapore, is temporarily appointed to be Civil Surgeon, Darjeeling, *vice* Major J. C. Drummond, on leave.

Captain S. Narain to be D. A. D. P., Kohat District. Dated 1st July, 1938.

Captain S. Sunkavally to be Officiating Surgical Specialist, Deccan District, Jubbulpore. Dated 13th June, 1938.

To be Lieutenant (on probation)

William Laurie, 15th May, 1938, with seniority 10th September, 1936. The period 29th January, 1937, to 2nd July, 1937 (inclusive), counts for purposes of promotion and increments of pay but not for retired pay or gratuity.

The undermentioned officers are reinstated to the establishment since 1st May, 1938. The seniority of these officers is ante-dated to the 1st May, 1937:—

Lieutenants (on probation):—

G. A. Graham.
D. McC. Black.

LEAVE

Brevet-Colonel J. W. Vanreenan, O.B.E., O. C., C. I. M. H., Abbottabad, proceeded on 2 months' privilege leave *ex*-India, with effect from the 23rd July, 1938.

Lieutenant-Colonel H. Chand, Civil Surgeon, Jullundur, granted an extension of leave on average pay for 2 months in continuation of the 2 months' leave granted, with effect from the 13th May, 1938.

Lieutenant-Colonel H. H. Brown, D. D. M. O. W., Army Headquarters, proceeded on 2 months' privilege leave *ex*-India, with effect from the 30th July, 1938.

Lieutenant-Colonel C. H. N. Baker, M.C., O. C., I. M. H., Ferozepore, proceeded on 2 months' privilege leave *ex*-India, with effect from the 28th July, 1938.

Lieutenant-Colonel P. R. Vakil, O. C., I. M. H., Jullundur, proceeded on 12 months' combined leave *ex*-India, with effect from the 13th July, 1938.

Lieutenant-Colonel R. Lee, O. C., I. M. H., Jubbulpore, proceeded on 3 months and 6 days' combined leave *ex*-India, with effect from the 16th July, 1938.

Lieutenant-Colonel R. F. D. MacGregor, M.C., an Agency Surgeon, is granted leave on average pay for 2 months and 22 days combined with leave on half-average pay for 3 months and 8 days, with effect from the afternoon of the 15th April, 1938.

Previous notification is hereby cancelled.

Major Sangham Lal is granted leave on average pay for a period of three months, with effect from the 10th June, 1938, or date of relief, whichever is later.

Major M. R. Sinclair granted 1 year's leave from 1st August, 1938, or date of relief.

Captain W. S. Morgan, O. C., I. M. H., Gyantse, proceeded on 12 months' combined leave *ex*-India, with effect from the 16th July, 1938.

PROMOTION

Lieutenant-Colonel to be Colonel

N. S. Sodhi, M.C. Dated 12th August, 1935, with seniority from 1st March, 1929.

Majors to be Lieutenant-Colonels

H. Das. Dated 11th July, 1938.
A. I. Cox. Dated 14th July, 1938.

Lieutenants (on probation) to be Captains (on probation)

W. McI. Wilson. Dated 19th May, 1938, with seniority from 1st August, 1937.

A. E. B. deCourcy-Wheeler. Dated 19th May, 1938, with seniority from 1st January, 1938.

G. B. Jackson. Dated 18th May, 1938, with seniority from 1st January, 1938.

W. L. Fennell. Dated 23rd May, 1938, with seniority from 1st January, 1938.

T. A. Cunningham. Dated 17th May, 1938, with seniority from 1st January, 1938.

D. R. Hanbury. Dated 19th May, 1938, with seniority from 1st January, 1938.

F. C. Griggs. Dated 10th June, 1938.

Lieutenants (short service) to be Captains

Dated 12th July, 1938

B. P. Bhattacharjya.
B. I. S. Bhalla.
P. N. Bardhan.
R. L. Mehra.
H. Akhtar.
H. N. S. Gupta.
V. W. Clifford.
M. B. Menon.
G. H. K. Niazi.
F. Z. H. Khattak.

Dated 15th July, 1938.

B. C. Roy.

RELINQUISHMENT

Captain N. P. P. Pillai relinquishes his temporary commission, 14th August, 1933.

Captain Sris Chandra Ray relinquishes his temporary commission, 1st August, 1927, and retains the rank of Captain.

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Lieutenant (on probation) A. F. Goode relinquishes his probationary appointment, 10th March, 1938.

RETIREMENT

Lieutenant-Colonel K. R. K. Iyengar. Dated 5th July, 1938.

Lieutenant-Colonel M. D. Wadia, Civil Surgeon, Ambala. Dated 5th July, 1938.

Lieutenant-Colonel S. S. Vazifdar. Dated 1st August, 1938.

Notes

NORWAY AND NORWEGIAN FISHERIES (LOFOT)

NATURE has gifted Norway with a very liberal distribution of sea, roughly 4,000 square miles in area. The country is very mountainous, only a small percentage of land being agricultural. In short, Norway is a land of mountain and flood.

The value of Norwegian fisheries has been known to the world from olden times. Norway still ranks first in the fishing industry of the world.

Owing to the peculiar depth and the sea currents along the mountainous coast, this region has been found a most suitable migrating centre by the cod fish for its annual spawning. The most important fishing centre of Norway is Lofot. These are a group of islands, situated in the Arctic circle, between the latitude 67° to 69°.

The chief visitors to these islands being the tourists to see the midnight sun, the cod fish, and the Norwegian fisherman. The cod fish forms 60 per cent of Norwegian fisheries. The average size of cod fish varies from 30 to 32 inches and weighs 10 to 12 lb. The liver averages 14 inches in length, 9 to 11 ounces in weight and is about 2½ inches thick at its central part. The weight of roe and milt average 13 to 20 ounces. Exceptions to the above do occur and cod fish 5 feet in length and over 90 lb. in weight are at times caught. Cod fish attain maturity at the age of six to seven years and reach an age of 20 years.

A female cod fish produces every year about 100,000 eggs for each pound of its weight, *i.e.*, an average spawner is responsible for a family of 1,200,000 every season.

The North Atlantic and Arctic oceans are said to be the home of the cod though its exact habitat is not known; but annually immense shoals of cod fish resort to the Norwegian sea-coast.

First shoals of cod appear in first week of January, but they are in full force in first week of March, and throughout the month of March the fishing is at its best. In the end of March, spawning begins and lasts for a few days. The mass of ova and milt liberated is enormous and sometimes causes the sea for miles around to assume a milky appearance. After spawning the cod fish soon return to their original abode and by the end of April the fishing season is over. Cod fish are obtained in large numbers where the temperature of water is near 50° centigrade.

There is no record fixing the exact date when cod-liver oil was first used, yet we know that it is a long established remedy. The oil used by the primitive people of the North Pole was a very crude product, but recently great advances have been made in its preparation.

For the successful manufacture of cod-liver oil the following conditions are necessary:—

(*a*) A supply of absolutely fresh livers.

(*b*) Temperature during fishing season should be near freezing point, in order that livers may not decompose soon.

(*c*) Supply of raw material should be such as to keep the factories continuously running.

At no other fisheries in the world all these conditions are as well fulfilled as in Norway.

The steam process of manufacture is quite simple. Healthy and fresh livers are washed thoroughly with water, of blood and other impurities, and the gall bladder removed; they are then put in boilers and steam is allowed to act. Within an hour, the oil is extracted by the action of moderate heat. It is allowed to cool, solid fats removed, and on filtration a light yellow oil, with practically no taste or odour, is produced. All barrels, tins and bottles are sealed under Government control and cannot be exported with certificate unless chemical investigation has proved the oil pure and genuine. It has all the therapeutic advantages of old type cod-liver oil and its value for medicinal purpose is established all over the scientific world.

SUGGESTION FOR SUNBURN

ONE of the most common ailments of the summer season is sunburn. Usually not serious, it is, however, extremely uncomfortable and often quite painful.

To soothe the skin, reduce the inflammation and withdraw the fluid from the blisters and blebs of sunburn, an antiphlogistine dressing applied cold is markedly efficient. Put on before retiring and left until morning, it will frequently make the patient quite comfortable.

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Original Articles

LATENT SYPHILIS IN THE TROPICS

By S. D. S. GREVAL
MAJOR, I.M.S.
P. C. SEN GUPTA, M.B.
and
B. C. DAS, B.Sc.
Department of Serology and Immunology, Calcutta School of Tropical Medicine

THIS study on latent syphilis was commenced in August 1937 in the Carmichael Hospital for Tropical Diseases. It involved doing a Wassermann reaction as a routine procedure on every patient admitted, and a critical examination of all cases giving a positive or a doubtful reaction but not admitted to the hospital for complaints obviously syphilitic. Method number 4 of the Medical Research Committee (1918) reinforced by the use of two additional antigens (for details *see* appendix) has been employed. The end in view is the obtaining of useful information on (I) existence of latent syphilis in the unselected hospital population of Calcutta, the patients not being admitted for obviously syphilitic complaints, (II) the effect of syphilis on the course of tropical diseases, (III) the effect of tropical diseases on syphilis, (IV) association of syphilis with diseases other than tropical diseases, (V) conditions other than syphilis which give a positive Wassermann reaction, and (VI) the significance of a positive Wassermann reaction and the Wassermann-positive rate in India.

I. Existence of latent syphilis in the unselected hospital population of Calcutta

Under this heading are studied the cases of latent syphilis proper. In them, the ordinary signs and symptoms, with or without treatment, have been absent. Signs and symptoms of other diseases have manifested themselves and defied all treatment (non-specific) which in some cases included operative measures.

Clinical notes regarding a few typical cases will serve as illustrations of this condition :—

Case 1.—Mrs. K. B., a Bengalee Mohammedan female, aged 33 years, was admitted for irregular attacks of fever and digestive disturbances, *viz*, indigestion, vague epigastric pain, constipation with occasional attacks of diarrhœa. She gave a history of chronic ill health since marriage four years previously. There was no pregnancy. She was curetted once, two or three years previously. She had some skin disease a year ago. On examination no abnormality was found anywhere. The only positive laboratory finding was a strongly positive Wassermann reaction [subsequently designated WR in case notes]. This was obviously a case of latent syphilis. She was advised a course of anti-syphilitic treatment and discharged.

Case 2.—S. M., a Bengalee Hindu male, aged 33 years, was admitted for attacks of fever which was sometimes remittent and sometimes intermittent. On examination the liver and the spleen were found to be enlarged and the aldehyde test was positive (though not strongly positive). This seemed to be a case of kala-azar—but on sternum puncture and also on liver puncture and culture no leishmania was found. On enquiry it was found that the patient had acquired syphilis about 22 years ago. WR was strongly positive. He had then been given some injections. The patient was put on anti-syphilitic treatment. Improvement soon commenced.

Case 3.—Mr. W., an Anglo-Indian male, aged 30 years, was admitted for investigation of persistent pain in the heels. Nothing positive was found on both clinical and laboratory examination except the presence of a benign tertian malarial infection and a positive WR. Malarial infection was first eradicated, but this did not have any effect on the pain in the heel. Enquiry into past history revealed that the patient had syphilis five or six years previously and that he had received two courses of injections.

He was put on anti-syphilitic treatment with favourable results.

Not many cases of latent syphilis are encountered.

II. The effect of syphilis on the course of tropical diseases

Under this heading are studied straightforward cases of syphilis and tropical diseases occurring in association. We have collected some cases under this group and a comparative study of the effects of syphilis on tropical disease is being carried on. One case is given as an illustration :—

Case 1. *Kala-azar and syphilis.*—A. B., a Bengalee Hindu female, was admitted for kala-azar. The aldehyde test was strongly positive and spleen puncture showed numerous L.-D. bodies. She was given a course of neostibosan and was discharged apparently cured. She was admitted again after 11 months suffering from fever off and on for five months. This time also the aldehyde test and spleen puncture were positive and she was given a course of solustibosan. This brought down the fever for a short period only. The liver and spleen did not go down to any marked degree. Her WR had all along been positive and her past history was suggestive of leutic infection. She was next put on anti-syphilitic treatment. This brought down the titre of her WR very slightly, but the aldehyde test was still strongly positive. The liver and the spleen went down to some extent. Another course of anti-syphilitic treatment was given followed by treatment for kala-azar. General condition much improved. Discharged from hospital three months ago. Will return on recurrence of fever. Has not yet returned.

This patient was one of the resistant cases of kala-azar, whether this marked resistance had anything to do with the presence of syphilitic infection is a question which can be answered only when large numbers of resistant cases have been studied with special reference to coincident syphilitic infection*.

III. The effect of tropical diseases on syphilis

Malaria therapy for syphilitic disease of nervous system is included in this group. Incidentally, syphilitic disease of the nervous

* Those with experience in the treatment of kala-azar have recognized syphilis as one of the complicating infections which tends to make patients resistant to treatment; a course of anti-syphilitic treatment will sometimes make a patient more amenable to subsequent treatment with an antimony preparation. But this provides no explanation for the majority of the 'resistant' kala-azar cases.—EDITOR, *I. M. G.*

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system is the only obviously syphilitic complaint for which patients are occasionally admitted to the hospital. The following case is an illustration :—

A case of tabes dorsalis associated with optic atrophy was admitted for investigation and treatment by malaria therapy. Even after a provocative injection the WR of the blood was negative though the WR of the cerebro-spinal fluid was strongly positive. Malaria therapy was instituted. After seven rigors it was deemed advisable to stop the fever. The pains in the limbs, which were not described very intelligently by the patient and which might have been 'lightning pains', disappeared almost entirely after malaria therapy. It is too early to say whether the progress of the optic atrophy has been arrested or not. The blood WR became doubtful after the malaria therapy.

We are keeping in touch with this patient who will be readmitted for observation and treatment.

IV. Association of syphilis with diseases other than tropical diseases

Under this heading is studied association of syphilis with diseases other than tropical diseases. The following are the illustrative cases :—

Case 1. *Anæmia and syphilis.*—K., a Bengalee Hindu male, 20 years old, was admitted for anæmia, enlargement of the liver and splenomegaly. There was no evidence of malaria or kala-azar. WR was positive. On examination it was found that he had some suspicious scars on the perineum, though he denied exposure or sore. No other abnormality was detected.

As the patient had hypochromic anæmia, he was given a course of ferrous sulphate—but there was no improvement. He was then given a course of anti-syphilitic treatment. Still there was no improvement in anæmia. The next course of ferrous sulphate which was given after the course of anti-syphilitic treatment rapidly cured the anæmia.

Case 2. *Rheumatoid arthritis and syphilis.*—Mrs. M. L., an Indian female, aged 35 years, was admitted for rheumatoid arthritis—duration one year. On a thorough investigation no septic focus was discovered anywhere and the only positive finding was a positive WR. There was a history of two miscarriages. Anti-syphilitic treatment brought about remarkable improvement. A bedridden patient was soon walking about in spite of the cold weather, when it is usual for cases of this type to get worse.

V. Conditions other than syphilis which give a positive Wassermann reaction

Under this heading are studied many conditions. We have come across eleven cases suffering from what appears to be a syndrome. The syndrome comprises dysfunctions of the gastro-intestinal tract with enlargement of the liver, or of the liver and spleen, irregular pyrexia, and loss of weight. The Wassermann reaction is not always strongly positive. Presumption of syphilis from physical examination, history and family history is on the whole weak. Anti-syphilitic treatment compatible with the hepatic lesion has given satisfactory results. Brief notes from two cases are worth including :—

Case 1.—R. D., a Bengalee Hindu female, aged 20 years, was admitted suffering from fever off and on for ten months ever since the last childbirth. The temperature rose sometimes with chill and rigor up to 104° or even 105°F. Other complaints were indigestion, anorexia, irregularity of bowels, dry cough and loss of weight. On examination the patient was found to be anæmic. The liver was enlarged and tender and the spleen was also enlarged. No other abnormality was detected. Laboratory examinations revealed moderate degree of leucocytosis with neutrophilia. WR was weakly positive. There were no other positive findings. Skiagram of the chest showed old healed infantile tuberculous lesion. Barium meal skiagraphy showed nothing to explain fever. Cholecystography showed that the dye had not entered the gall bladder.

The patient continued to have irregular attacks of fever. One bout was prolonged and the Widal test was once positive against *B. typhosus* (H : 1 in 1,600 and O : 1 in 200) though the clinical picture was unlike that of enteric fever.

The patient received treatment for malaria, amœbic hepatitis, cholecystitis, but to no effect. Ultimately she was transferred to Prince of Wales Hospital as a case of splenomegaly for splenectomy. But this operation was not performed, apparently on account of her weak condition, and she was sent back.

The patient was next given some stock cholecystitis vaccine but to no effect. She was then given an injection of bismuth. This was followed by a drop in temperature and the subsequent injections of bismuth led to a cure. Before discharge the patient was afebrile for three weeks, had gained 3 lb. in weight and her liver and spleen had diminished in size.

In this case the WR was 'weakly' positive to start with. After first injection of bismuth it was 'positive'. The blood of the husband was negative and there was nothing in the marital history to suggest syphilitic infection—three healthy children, no history of miscarriage. (This patient's blood is not included in the WR results given in the appendix.)

Case 2.—G. B., an American boy, aged 9 years, was admitted for low pyrexia for two to three months. On examination, the liver was found to be enlarged and firm. No other abnormality was detected anywhere else. The only positive laboratory finding was a strongly positive WR. On examination for scars, etc., nothing suspicious was found. No history of miscarriage was obtained from the mother. A course of bismuth injections was given. The fever subsided after the second injection and the boy steadily increased in weight and improved in general health. The liver decreased in size. The patient was discharged with advice to continue treatment.

In this case too presumption of syphilis is weak. The WR was negative in his parents and other children in the family. On the 8th March, 1938, after only two courses of bismuth injections (16 injections in all) and a mixture containing mercury and iodide, the WR was completely negative. General health was good.

Other conditions are bouts of pyrexia from any cause, eosinophilia and allergic conditions acute, or chronic. We describe a few illustrative cases :—

1. *Malaria giving rise to positive Wassermann reaction*

R. C., an Anglo-Indian male, aged 19 years, was admitted for frequent attacks of malarial fever, duration about 14 months. He had an enlarged liver and spleen and his indirect van den Bergh reaction was strongly positive. No other abnormality was detected and there was nothing in the past history or family history, nor were there any signs of syphilitic infection. WR was positive. After the patient had been cured of the malarial infection and his blood condition had improved (no anæmia and a negative van den Bergh), WR was found to be completely negative.

2. *Kala-azar giving rise to positive Wassermann reaction*

P. B., a Bengalee Hindu female, aged 28 years, was admitted for kala-azar. The aldehyde test was strongly positive and leishmania were present in the spleen puncture smear. WR was positive. There was nothing in her marital history suggestive of syphilis. The patient was treated with a course of neostibosan.

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After the course of treatment and improvement in her general condition the WR became negative.

3. *Blackwater fever giving rise to positive Wassermann reaction*

S. N. R., a Bengalee Hindu male, aged 28 years, was admitted for blackwater fever. He had an enlarged liver and spleen. The heart was slightly dilated. No other abnormality was found and there was nothing in the history or physical examination to suggest a syphilitic infection. WR done on admission (during fever) was positive. When it was repeated during convalescence it had become doubtful. The patient left hospital before the final test could be done.

4. *Fever and dysentery-like symptoms giving rise to positive Wassermann reaction*

H. D'A., an Anglo-Indian female child of 6 years, was admitted with a history of irregular attacks of fever for one year and dysentery for two to three days. Her liver was enlarged. No other abnormality was detected. Stools did not show any *Entamœba histolytica* nor any dysentery bacillus. WR was positive. The child recovered after treatment for dysentery and a course of hydrag. cum creta for ten days. During convalescence WR was done again and it was found to be negative.

5. *Eosinophilia associated with a positive Wassermann reaction*

S., a Hindu female, aged 13 years, was admitted for low fever and cough and enlarged tonsils. She had 80 per cent eosinophils and WR was positive. No other abnormality was detected. When her tonsils were removed the patient became afebrile. She was then given a course of arsenic injections. After six injections her WR was negative. Her total eosinophil count had also decreased to 12 per cent.

6. *Asthma associated with a positive Wassermann reaction*

C. S. W., an Anglo-Indian male, aged 29 years, was admitted for asthma—duration 12 years. Usual signs of asthma present. Examination of blood showed an eosinophilia of 45 per cent. WR was positive. History and signs of syphilis were absent. Injections of peptone were given for asthma after the acute phase had subsided. There were no further attacks in hospital. WR repeated and found to be doubtful. Eosinophils were now only 5 per cent. Before discharge the reaction was completely negative.

VI. The significance of a positive Wassermann reaction and the Wassermann-positive rate in India

These two apparently unrelated items are discussed together because they have been linked together by nearly all the previous workers in India. The workers have first established or accepted a high Wassermann-positive rate for an unselected Indian male population. They have then rejected the possibility of there occurring a non-specific positive Wassermann reaction in certain tropical diseases, because the percentage of the reaction in the diseases was not higher than the percentage for the unselected population. Our positive Wassermann reaction in diseases other than syphilis has been followed up. Many of them have turned doubtful or negative, a fact which proved definitely the occurrence of a non-specific reaction in certain tropical diseases. By reversing the process of the previous workers we argue that our initially low percentage for the unselected Indian population should be lowered still further because of the occurrence of non-specific reaction in the tropics.

1. *Review of previous work*

Sutherland and Mitra (1915) tested 50 cases of malaria, 34 cases of leprosy and 38 cases of kala-azar. Regarding malaria they came to the conclusion that an attack of malaria after the return of the temperature to the normal and chronic malaria were not the cause of a positive Wassermann reaction. Regarding leprosy they summarized all work done up to 1915, but expressed no opinion. Like others they found cases of leprosy with a positive Wassermann reaction. In kala-azar they found 10 cases with positive reaction. The reaction in two of them was stronger than in the remaining eight. Again they expressed no opinion as to whether or not kala-azar was the cause of a positive Wassermann reaction. Their technique was evolved in this laboratory. A specially selected antigen and a rather high single dose of complement were used.

Iyengar (1919) employing method number 4 of the Medical Research Committee did a Wassermann reaction on 400 unselected apparently healthy Indian males attending the Pasteur Institute of India, Kasauli; 22 per cent of them were positive. This percentage Iyengar regarded as the positive rate for the male Indian. After establishing the positive rate he (1919*a*) did a Wassermann reaction on 100 cases of leprosy and obtained a positive rate of 41 per cent; he came to the conclusion that leprosy was the cause of a positive Wassermann reaction. Later (1920), he did a Wassermann reaction on 84 cases of malaria and obtained a positive rate of 8.3 per cent; he came to the conclusion that malaria was not the cause of a positive Wassermann reaction. Later still (1923), he did a Wassermann reaction on 30 cases of kala-azar and obtained a positive rate of 20 per cent. In view of his original positive rate for the apparently healthy male Indians, he came to the conclusion that kala-azar was not the cause of a positive Wassermann reaction.

Megaw and Mullick (1928) commenting on Wassermann reaction of 400 hospital cases, tested by Sutherland's technique, inclined to the view that there were more positive reactions in the 90 kala-azar cases than in the remaining 310 non-kala-azar cases. They inferred that either kala-azar was the cause of a positive Wassermann reaction or syphilitics were more liable to develop kala-azar than normal individuals.

Lloyd, Napier and Mitra (1930) first reviewed the work on the subject and agreed with Iyengar's Wassermann reaction positive rate in India, 22 per cent, which according to them 'approximates very closely to the estimated syphilis rate of the Calcutta hospital population which is believed from evidence of various kinds to be round 20 per cent'. Then they

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gave their own findings. They found 105 positive reactions in 474 kala-azar cases, or a positive rate of 22 per cent, which they considered to be normal positive rate for India. They came to the conclusion that kala-azar was not the cause of a positive Wassermann reaction. They used Sutherland's technique.

These writers referred to another series of 101 cases of kala-azar in which they found 29 positive reactions. This figure they considered somewhat higher than the percentage ordinarily yielded.

Lloyd (1932) commenting on the interpretation of Wassermann reaction in India again states that 'the occurrence of positive reactions in malaria is partly a question of technique and partly a question of concomitant syphilis'. In his work on malaria, even with a supersensitized antigen (cholesterinized Bordet antigen) he found no positive reactions.

2. *Our work**

In our series of 400 unselected Indian cases from the Carmichael Hospital for Tropical Diseases, Calcutta, there were 51 positive cases giving a Wassermann reaction positive rate of 12.75 per cent which is appreciably lower than Iyengar's positive rate of 22 per cent.

Further, as we have shown that conditions (acute, subacute and chronic) other than syphilis are the cause of a positive Wassermann reaction, our rate of 12.75 per cent is the crude rate, not the corrected rate. In order to obtain the latter, from 51, representing the positive cases, should be deducted 10, representing the cases with negative histories, no signs of syphilis *and negative Wassermann reactions on subsequent tests*, without any or very inadequate treatment for syphilis. The deduction leaves 41 positive cases in 400 or a 10.25 per cent corrected rate. How many more cases with negative histories and no physical signs of syphilis could be deducted, if facilities for longer observation existed, is a problem worth investigation. The presumption is that more deductions would be possible. That in the tropics defined and undefined infections are the cause of a positive Wassermann reaction has been observed. That some reactions should last longer than others is a reasonable supposition.

The number of Wassermann reaction positive cases in our series of 200 Europeans (and others included in the same group) was 20, giving a positive rate of 10 per cent. Deducting 4 cases with negative histories, no signs of syphilis and negative Wassermann reactions on subsequent tests, the figure would be reduced to 8 per cent. The Wassermann-positive rate of both groups is of about the same order.

Sutherland and Mitra, in their paper referred to above, mentioned that 'Meier and Bonfiglio were reported by Wassermann to have found that in the tropics no case of suspected syphilis should have its Wassermann reaction taken unless it has been free from malaria for three months and no case of any kind should have the Wassermann reaction taken unless the patient has had no fever for a month previous to the examination of his blood'. They called this view pessimistic. Our study has made us mindful of pessimistic possibilities in the interpretation of a positive Wassermann reaction in the tropics.

The corrected positive rate for an unselected Indian population should be *under* 10.25 per cent. In America, according to Becker (1937), it is only 10 per cent. Becker considers the 10 per cent rate a public health problem; a 22 per cent rate would be a public health crisis.

In India, a higher figure would not be compatible with the social and economic order of things. The bulk of the population of marriageable age is married and therefore so situated that its main concern is alimentation, not gratification of sexual desires, illicitly.

The only explanation we can offer of the marked difference between the previous workers' figures and ours is that quite a large number of reactions read as positive must have corresponded to what the senior writer (Greval, Yesudian, and Choudhury, 1930) described as 'irregular reaction'. It is not unusual in a day's work to find more than half of the apparently positive reactions really irregular (= doubtful). Such readings are fully supported next day in the ward and confirmed later by further blood tests.

An erroneously high reading is obtained in method number 4 if a trace of lysis in both the tubes containing antigen is ignored. In a method employing a large single dose of complement nothing is easier than to obtain an erroneously high reading. In a 'moderately positive' reaction a trace of lysis is not excluded. 'Weakly positive' and 'doubtful' reactions are both associated with more than a trace of lysis. Most of these reactions are really doubtful reactions. First diagnosis of syphilis is not to be based on a doubtful reaction.

Incidentally, we do not intend to belittle the significance of a doubtful reaction. (1) In cases of chancre, proved microscopically, it confirms the diagnosis of syphilis; (2) in early infections, up to three to five years (depending upon circumstances) it indicates a continuation of the usual treatment; (3) in late infection after three to five years it indicates a thorough examination of the patient and employment of special measures, if necessary, in preference to the usual treatment; and (4) it disqualifies a donor of blood.

It may be observed that with the exception of our 200 European and Anglo-Indian cases the figures referred to in this communication, on which important conclusions have been based, are of about the same order, *viz* :—

(1) Iyengar's 400 unselected Indian cases for the Wassermann reaction positive rate in India, from Kasauli in 1919.

* For figures *see* Appendix.

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(2) Megaw and Mullick's 400 unselected cases from the Carmichael Hospital for Tropical Diseases, Calcutta, in 1928.

(3) Lloyd, Napier and Mitra's 474 cases of kala-azar from the same hospital reported in 1930.

(4) Our 400 unselected Indian cases from the same hospital this year (1938).

The conclusions emerging from this study have yielded definite information on the two items discussed under this heading (VI). In view of the importance of the items and the information obtained the title of this paper could have been *The significance of a positive Wassermann reaction and the Wassermann reaction positive rate in India.*

Summary and conclusions

A study of latent syphilis has been undertaken in the Carmichael Hospital for Tropical Diseases, Calcutta, with a view to obtaining information on (*i*) latent syphilis in the hospital population, (*ii*) effects of syphilis on tropical disease, (*iii*) effect of tropical diseases on syphilis, (*iv*) association of syphilis with other diseases, (*v*) conditions other than syphilis which give a positive Wassermann reaction (attention is drawn to a syndrome comprising dysfunction of gastro-intestinal tract with enlargement of liver or liver and spleen, pyrexia and loss of weight; the Wassermann reaction is positive or doubtful; personal and family history are against a diagnosis of syphilis; results of treatment by arsenic or bismuth are good), and (*vi*) the significance of a positive Wassermann reaction and the Wassermann-positive rate in India (conditions other than syphilis are definitely the causes of a positive Wassermann reaction in India); properly corrected Wassermann-positive rate, indicative of syphilis, for Indians should be *under* 10.25 per cent and for Europeans—and others included in the same group—*under* 8 per cent; the difference is not significant.

Details of the technique followed and the results of the Wassermann reaction of 600 cases, under observation in the wards of the Carmichael Hospital for Tropical Diseases, are given in the appendix.

Acknowledgments

It was only possible to undertake this study after the Director and the Governing Body of the Endowment Fund of the School of Tropical Medicine had found it possible to place the services of a worker at the disposal of the senior writer.

The clinical work involved in the study, apart from establishing or ruling out a diagnosis of syphilis, was undertaken by the physicians of the Carmichael Hospital for Tropical Diseases, to whom our thanks are due for their co-operation.

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APPENDIX.

I. Technique.

II. Reading of results.

III. Results of Wassermann reaction in 400 Indian and 200 European (and other) cases from the Carmichael Hospital for Tropical Diseases, Calcutta.

IV. Procedure with cerebro-spinal fluid.

V. Preparation of and remarks on Bordet's antigen.

I. Technique

Method number 4 of the British Medical Research Committee was employed with the following modifications :—

1. The serum control was put up with the functioning dose of the complement, *i.e.*, 2 M.H.D. instead of 3 M.H.D.

2. The complement and the antigen were mixed and the mixture added to the serum.

3. The r.b.c. suspension was standardized in accordance with the senior writer's scheme (1930).

4. Three antigens were used :—

(*i*) The ordinary antigen used in the method. But the heart extracts were specially selected for sensitiveness and specificity, after testing with strongly positive and negative sera. Only suitable heart extracts were cholesterinized. The antigen was put up with the usual quantity of the serum and 3 M.H.D. and 5 M.H.D. of complement.

(*ii*) The uncholesterinized heart extract (after selection) diluted 1 in 15 with saline. This fluid was put up with the usual quantity of the serum and 4 M.H.D. of complement. It is not anti-complementary; 4 doses of complement, therefore, correspond to the 5 doses used with the cholesterinized antigen which is anti-complementary to the extent of 1 M.H.D.; there are 4 functioning doses present in each case.

(*iii*) Bordet's antigen (for preparation see item IV of this appendix). This antigen has been in use in this laboratory for a very long time. Three parts of the final alcoholic extract were mixed with 2 parts of a 1 per cent alcoholic solution of cholesterol. One part of the cholesterinized extract was diluted with 49 parts of

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saline. 0.25 c.cm. of this fluid was put up with the usual quantity of the serum and 2 M.H.D. of complement. The fluid is not anti-complementary; 2 doses of complement, therefore, correspond to the 3 doses used with the ordinary antigen.

5. Incubation. The final incubation, after adding the r.b.c., lasted half an hour.

6. Second reading. The tubes not showing a column of colourless fluid on top of sedimenting r.b.c. and the tubes showing lysis bordering on complete lysis were left in the cold overnight and re-examined next day for :—

(*i*) Traces of lysis in tubes showing apparently complete inhibition on the first day. A trace of lysis converted + into T.

(*ii*) Comparing the colour in tubes bordering on complete lysis on the first day and negative controls. An equality of colour and absence of a coloured deposit at the bottom of the tubes converted ± into ? — (reported negative).

II. Reading of results

1. Complete inhibition of lysis with the plain alcohol heart extract = +++ (strongly positive).

In this case there is a complete inhibition in all other tubes also.

2. No inhibition of lysis with the plain alcoholic heart extract but complete inhibition with the ordinary antigen both with a M.H.D. and 5 M.H.D. = ++ (positive).

In this case there is a complete inhibition with Bordet's antigen also. (With the plain alcoholic heart extracts there may be an incomplete inhibition).

3. Complete inhibition with the ordinary antigen and 3 M.H.D. of complement with or without partial inhibition with 5 M.H.D., also complete inhibition with Bordet's antigen and 2 M.H.D. of complement = + (weakly positive).

Such reactions are not common.

4. Traces of lysis or considerable lysis in both the tubes of the ordinary antigen (with 3 M.H.D. and 5 M.H.D.) = irregular reaction = ± = doubtful.

In this case there may or may not be an inhibition with Bordet's antigen. The fact is noted as +, T, ±, ? — or — Bordet.

5. Partial lysis with ordinary antigen and 3 M.H.D. complement = ± (doubtful).

In this case there may or may not be an inhibition with Bordet's antigen. The fact is noted as +, T, ±, ? — or — Bordet.

6. Lysis almost complete but not quite with the ordinary antigen and 3 M.H.D. complement = ? — (reported negative).

In this case a similar reaction with Bordet's antigen is noted and ignored for the purpose of a report. But a stronger inhibition of lysis is against reporting the case negative.

The question is being studied whether or not a serum giving a doubtful reaction with the ordinary antigen and a clear negative reaction with Bordet's antigen should be reported negative.

7. Lysis complete with ordinary antigen = —, negative. Reaction with Bordet's antigen in this case, if other than negative, is ignored.

In reading these results the serum control may be free from an inhibition of lysis or may show a slight inhibition in 1 and 2. It should be completely free from an inhibition in 3, 4, 5 and 6; otherwise a corresponding degree of inhibition in the tubes of the test proper must be ignored; in 3 the test must be repeated with further dilution of serum until the serum control is free from inhibition of lysis. When there is no lysis or only a trace of lysis in the serum control, the serum is reported anti-complementary, if enough of it is not left for further detections and tests.

III. Results of Wassermann reaction in a series of 600 *cases from the Carmichael Hospital for Tropical Diseases, Calcutta*

	Indian	European, Anglo-Indian and others
	400	200
Strongly positive ..	6	1
Positive	43	18
Weakly positive ..	2	1
Doubtful with both antigens	74	32
Doubtful with Bordet's antigen only ..	13	3
Doubtful with ordinary antigen only ..	55	14
Anti-complementary ..	8	3
Negative	199	128
Total ..	400	200

The figures indicate the highest reading of the positive cases (after a provocative injection in some cases) and the first reading of the doubtful cases. Anti-complementary cases were discharged before the test could be repeated to obtain a reading. No case has been included twice. A large number of doubtful cases and some positive cases were found negative on subsequent tests done at suitable intervals.

Giving effect to the suggestion that a doubtful reaction with one antigen only should be disregarded, the Indian figures will be :—

Strongly positive	6
Positive	43
Weakly positive	2
Doubtful	74
Anti-complementary	8
Negative	267
Total ..	400

The figures in the corresponding series of 400 cases reported by Megaw and Mullick (1928) ten years ago from the same hospital are :—

Strongly positive	25
Moderately positive	76
Doubtful	34
Negative	265
Total ..	400

It is evident that the sole cause of difference is the category 'moderately positive'. The

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number of negative cases is almost identical. We presume that about half the cases grouped under the category 'moderately positive' would correspond to our doubtful cases.

IV. Procedure with cerebro-spinal fluid

Partly following Wyler (1929) the fluid, without inactivation, was put up for the test in two strengths : (1) undiluted fluid, and (2) two volumes of undiluted fluid instead of one volume. 5 M.H.D. tube was omitted. Inhibition of lysis in the tube containing two volumes of undiluted cerebro-spinal fluid, even when complete, was not accepted as positive unless there was also a definite inhibition of lysis in the tube containing one volume of undiluted fluid.

The results were read:—

+++ = Strongly positive, when complete inhibition of lysis occurred with the uncholesterinized heart extract in one or both tubes.

++ = Positive, when complete inhibition of lysis occurred in both the tubes put up with cholesterinized antigen.

+ = Weakly positive, when inhibition was complete with two volumes of the fluid and partial but well marked with one volume, with cholesterinized antigen.

± = Doubtful, when partial but well marked inhibition occurred in one or both tubes, with cholesterinized antigen.

− = Negative, when no inhibition or inhibition of a poor quality occurred, with cholesterinized antigen.

A tube was also put up with Bordet's antigen (cholesterinized), one volume of fluid and 2 M.H.D. of complement. An inhibition of lysis in this tube supported the inhibition of lysis in the corresponding tube put up with the ordinary antigen.

V. Preparation of and remarks on Bordet's antigen

This antigen, which has been in use in this laboratory for a long time, is prepared as follows :—

1. One hundred grammes of human heart muscle cut into pieces (not minced) is left in contact with 125 c.cm. of absolute alcohol, in a stoppered bottle, for a week.
2. The alcohol is poured off and the muscle dried in an incubator for 24 to 48 hours (should be like pieces of wood).
3. The dried muscle is left in 200 c.cm. acetone for a week, in a stoppered bottle.
4. The acetone is poured off and another lot of 200 c.cm. added.
5. After 24 hours the second lot of acetone is also poured off and the muscle dried in an incubator until free from smell (3 days or more).
6. The dried muscle is powdered and the powder extracted with 200 c.cm. of absolute alcohol for 10 days, in a stoppered bottle.
7. The stoppered bottle is shaken and the contents filtered through a filter paper. The filtrate is Bordet's antigen.
8. To 30 c.cm. of Bordet's antigen is added 20 c.cm. of 1 per cent of cholesterol in absolute alcohol. The mixture is cholesterinized Bordet's antigen.

(*Continued at foot of next column*)

A NOTE ON RACIAL VARIATIONS IN LEPROSY WITH PARTICULAR REFERENCE TO INDIAN AND BURMESE RACES

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On various occasions I have expressed the view that in different races in different countries, there may be considerable variation in the clinical manifestations of leprosy and also in certain aspects of the epidemiology of the disease. I have suggested that these variations are probably due to differences in the susceptibility of different races to leprosy, *i.e.*, to differences in their physiological and immunological 'make up' as manifested by differences in the way their body tissues react to invasion by the leprosy bacillus. I have expressed these views rather tentatively since my experience of leprosy in races other than Indians is not great. A few other workers, particularly Cochrane (1935), Wade (1937), Ryrie (1934), have expressed similar views, although accurate data on the subject are very limited.

Recently, I paid a visit of three and a half weeks' duration to Burma in order to study the leprosy problem. Now, Burma is a country where, particularly in the Irrawaddy Delta, there is a mixed population chiefly of Burmans and Indians; there is also a considerable incidence of leprosy. It, therefore, affords a splendid opportunity of making a comparative study of leprosy in these two races. Unfortunately in the short time spent in this area (only a few days) it was impossible for me to make a very thorough study of the subject. It is hoped that opportunity will occur for a much more thorough study in

(*Continued from previous column*)

The cholesterinized Bordet's antigen in a 1 in 50 dilution in normal saline is not anti-complementary when used in the place of the ordinary antigen in method IV. This fact saves one titration of complement and one hour if no other antigen is employed in the test. Further, the antigen has enjoyed a local reputation of being more sensitive than the ordinary alcoholic antigen cholesterinized. We have used it merely as an extra antigen and assigned to it a secondary importance. No serum completely negative with the ordinary antigen has been taken as doubtful because of a partial inhibition of lysis with Bordet's antigen. Nor has a serum doubtful with ordinary antigen been taken as weakly positive because of a stronger reaction with Bordet's antigen. Only sera not completely negative with ordinary antigen and definitely doubtful with Bordet's antigen have been taken as doubtful; there are not many reactions of this type.

On the comparison between the two antigens more will be said elsewhere.

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which bacteriological and histological examinations will be included. The information collected during my recent visit was almost entirely clinical, and although it is very incomplete, it is, I think, not without interest.

1. *Type distribution*

Racial variations in leprosy show themselves in variations in the type distribution of leprosy cases, *i.e.*, the number of cases of 'neural' type compared with the number of cases of 'lepromatous' type. In a recent statistical survey in Bengal, cases of neural type were found to form 82 per cent of the total. A similar survey in the Philippine Islands has shown 50 per cent of cases of neural type. A report from one part of Africa has indicated a proportion of 95 per cent.

During my visit to Burma no detailed statistical survey could be made but certain information was collected which bears on the subject.

(*a*) *Type distribution of cases in Indians and Burmans in Rangoon.*—For information on this subject I am very deeply indebted to Dr. L. Kun Lwin who, at my request, prepared a statement of the clinical classification and results of bacteriological examination of 464 patients in his charge at the Rangoon Leper Asylum and at the clinic at the Rangoon General Hospital. From his statement the following figures are prepared :—

Rangoon Leper Asylum

		Lepromatous type		Neural type	
Burmans	.. 269	202	(75 per cent)	67	(25 per cent)
Indians	.. 106	41	(39 per cent)	65	(61 per cent)

Of course these figures collected in a leper asylum do not indicate the type distribution of cases in the general population, but they give a strong indication of a marked racial difference.

(*b*) *Figures collected in leprosy clinics in Burma.*—These are as follows :—

		Lepromatous type		Neural type	
Burmans	.. 1,013	566	(56 per cent)	447	(44 per cent)
Indians	.. 55	17	(31 per cent)	38	(69 per cent)

Here the figures for Indians are very small and were all collected only at the Rangoon General Hospital by Dr. L. Kun Lwin. The figures for Burmans were collected and verified by me in various outpatient clinics chiefly in central Burma where Indians are very few.

(*c*) *Figures collected in villages in Burma.*—These figures relate only to Burmans since the number of Indians in the villages visited was negligible.

		Lepromatous type		Neural type	
Burmans	.. 900	479	(53 per cent)	421	(41 per cent)

These figures are based on reports of surveys carried out by Dr. U. Tha Din, Special Leprosy Officer, Burma, and on my own reports of a number of villages visited during my tour. My own findings are in agreement with those of Dr. U. Tha Din. It is highly probable that in these villages some slight cases of neural type were missed, but these figures differ very strikingly from the reports of similar rough survey work done in India, in which the number of cases of neural type is sometimes three or four times greater than the number of cases of lepromatous type.

(*d*) *Conclusions*—I think that the figures quoted indicate very strongly that the type distribution of leprosy cases in Burmans differs markedly from that of Indians domiciled in Burma or in India, and that in Burmans cases of lepromatous type form a much higher proportion of the total.

2. *The age distribution of leprosy in Burmans and Indians*

Only a small amount of information on the subject was collected. Of 208 Burman male patients in the Rangoon Leper Asylum 71 per cent were under the age of 30 and the average age was 25.

Of 103 Indian males in the same institution only 40 per cent were under the age of 30 and the average age was 34.

In spite of this lower average age of the Burmans, the Burmans showed, as reported above, a much higher incidence of the severe lepromatous form of leprosy.

Another interesting point observed in Rangoon was the difference in the age distribution of slight cases of neural leprosy in the two races. Of 21 such cases seen in Burmans, only 7 (33 per cent) were over the age of twenty, while of 36 similar cases seen in Indians, 28 (78 per cent) were over the age of twenty. These figures are rather small, but they correspond to the findings made in Indians in India, and in Burmans in other parts of Burma visited. In India we find slight cases of neural leprosy in all age groups of the population although they are commonest in young people. During my tour in Burma I tried to find such cases amongst adult Burmans but very few were seen among nearly 2,000 patients.

A difference was also seen in the age distribution of severe cases of lepromatous type in the two races. In Indians severe lepromatous forms of the disease are seen chiefly in adults though they do sometimes occur in children. Among Burmans however the severe lepromatous cases in young children are very much more common, and also more severe. In India it would be very difficult to collect so many children with such severe leprosy as the Burmese children in the Rangoon Leper Asylum. They reminded me strongly of the Chinese leper children in Malay.

What is the significance of these findings ? I surmise that both Indians and Burmans commonly get infected in childhood or adolescence, and usually show, to begin with, a mild neural form of the disease. In Indians this form may persist for a long time and possibly throughout life, but in Burmans the disease much more often progresses, and progresses with greater rapidity,

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Fig. 1.—Healing of ulcerating tuberculoid lesions. Note very extensive scarring.

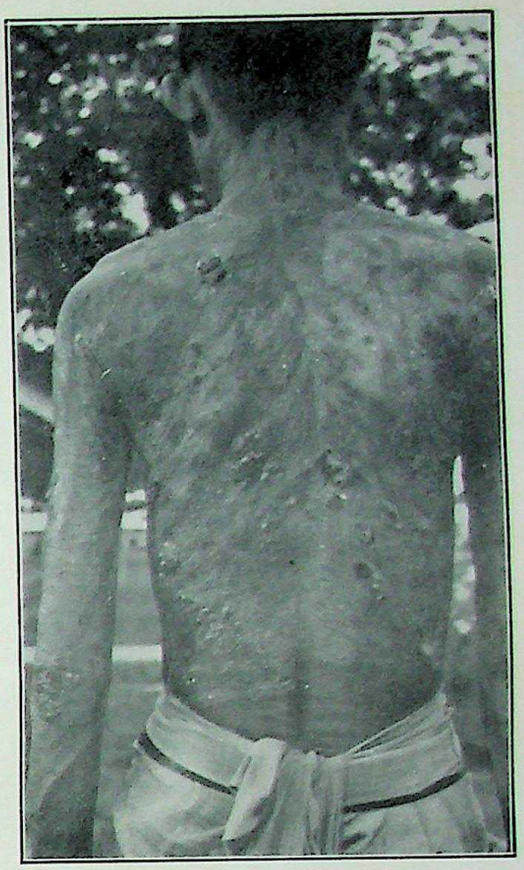

Fig. 2.—Back of same patient. Some ulcers not completely healed.

Fig. 3.—Face of similar case. Healing complete. Note destruction of ear lobe.

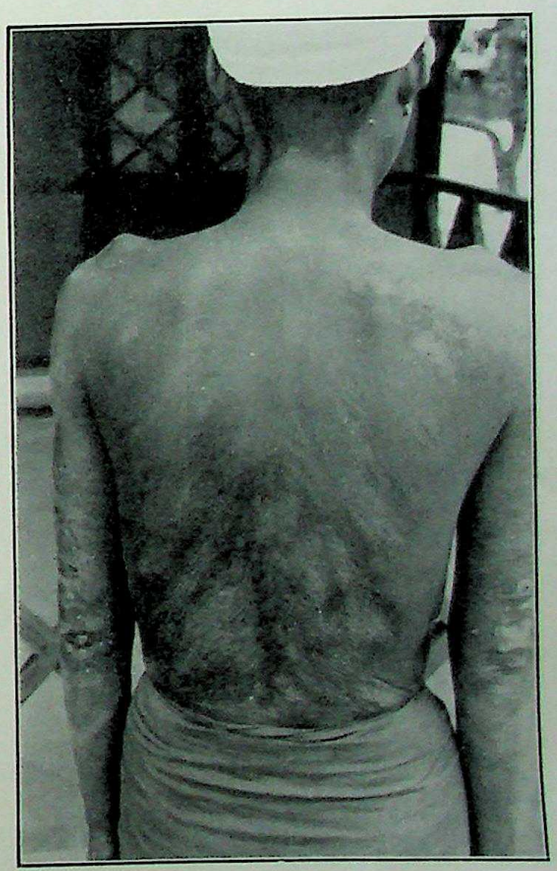

Fig. 4.—Back of same patient, showing extensive scarring.

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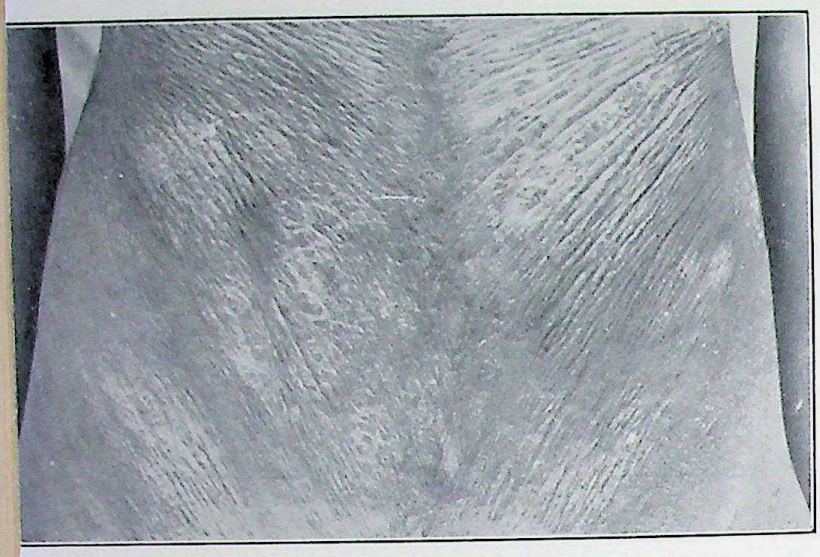

Fig. 5.—Close view of back showing scarring and atrophy of skin.

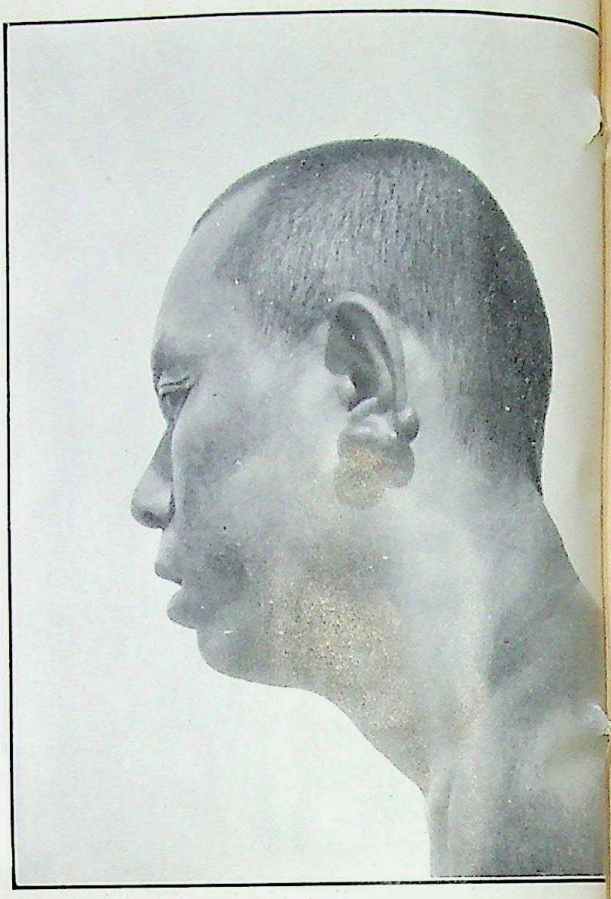

Fig. 6.—Patient showing marked nodulation of one e and no other visible lesion.

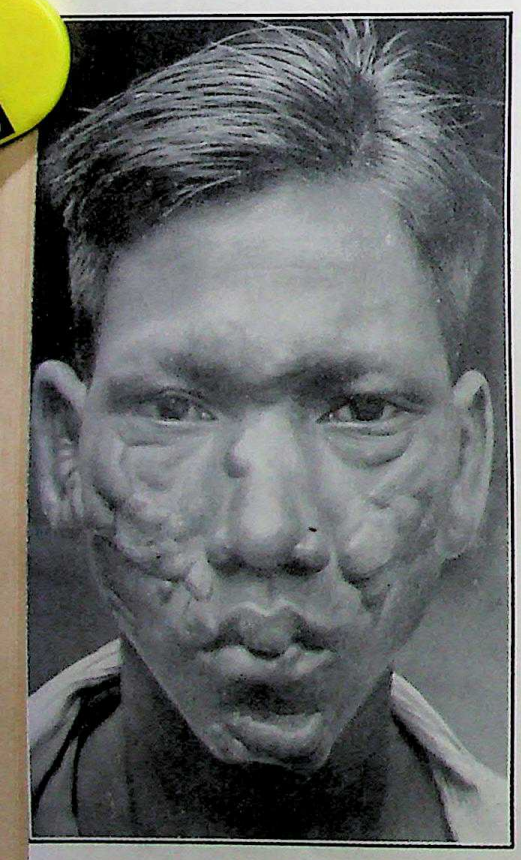

Fig. 7.—Boy showing very marked nodulation with apparently normal skin between the nodules.

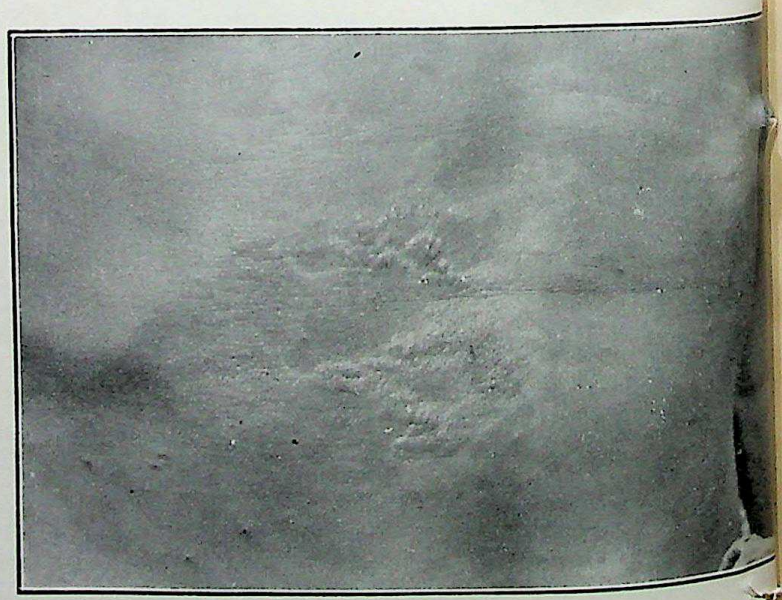

Fig. 8.—Leprous infiltration on body. Note 'islands' of normal skin.

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to the severer forms of the disease, sometimes of neural type but very often of lepromatous type. It is also surmised that the severe lepromatous form of leprosy seen in Burmans may more frequently cause death than the milder forms seen in Indians, and that this may influence the age distribution of the cases in the two races, old Burmans suffering from leprosy being rare.

3. *Differences in clinical manifestations of leprosy in Indians and Burmans*

On this subject I can quote only my own general impressions after seeing nearly 2,000 cases of leprosy in Burma and comparing them with cases of leprosy in Indians in Rangoon and in India, numbering many thousands, seen under similar conditions.

In Indians the classification of cases into neural and lepromatous types usually presents little difficulty. Here and there is found a case difficult to classify. In Burma however for reasons which appear later, the classification of cases presented much more difficulty, many cases showing lesions not entirely characteristic of either type as seen in India.

In Indians the characteristics of neural leprosy may be summarized as follows :—clearly defined and circumscribed macules of different kinds, with sensory change, thickening of cutaneous nerves and of nerve trunks, with anæsthesia and trophic lesions, and usually the absence of lepra bacilli from smears taken from the lesions. The characteristics of the lepromatous type of leprosy in Indians are the lepromatous infiltration of the skin, sometimes nodular but much more often diffuse, with many bacilli in the lesions.

In Burmans the two main types of leprosy were much less clear cut. We will discuss the different types of lesions seen in Burmans.

(*a*) *Neural type.*—Macules. These lesions were on the whole very similar to those seen in Indians except that the skin of Burmans being lighter, depigmentation was less marked, and erythema was more easily detected. The sensory change in macules was usually very definite. In Burmans however the thickened frankly tuberculoid lesions so commonly seen in India were much less common, most being of the flat, simple or very 'minor tuberculoid' variety. This finding is probably connected with the fact that most of the neuro-macular lesions were seen in children while the frank tuberculoid lesions are always more common in adults. However, lesions of the 'major tuberculoid' variety were seen in considerable number in Burma, even in children, and I also saw two cases of tremendously marked ulcerating tuberculoid lesions similar to those which have been described by Ryrie as occurring in Chinese in Malaya (*see* plates XII and XIII).

Nerve thickening. Thickening of cutaneous nerves and of nerve trunks was very commonly seen, almost as commonly as in Calcutta, but the degree of thickening was on the whole much less than that seen in Calcutta. Only one case of definite nerve abscess was seen and that was a small abscess on a small nerve supplying a macule. Several very thick nerve trunks, probably caseous, were seen, but they were less common than in Calcutta.

Trophic lesions, deformities, etc., in Burmans showed nothing of particular interest except that, as in India, trophic ulcers of the sole were usually associated with marked lesions of the posterior tibial nerve at the ankle.

(*b*) *Development from neural to lepromatous type.*—A considerable number of cases were seen in which the lesions were either 'reacting' tuberculoid lesions in which smears showed an abnormally large number of bacilli, or else were lepromatous lesions developing from a previously existing tuberculoid lesion. In addition there were many patients in whom the lesions were definitely of lepromatous type, but the peculiarly localized nature of the lesions and their peculiar distribution, and the fact that involvement of cutaneous nerves supplying the lesions was found, indicated very strongly that these lepromatous lesions had developed from previously existing tuberculoid lesions.

This phenomenon, tuberculoid reaction being followed by lepromatous change, is sometimes seen in Indians, but in Burmans it appears to be much more common.

It is this intermediate type of case met with so commonly in Burma which is so difficult to classify.

(*c*) *Lepromatous type.*—It is in the lepromatous type of lesion that the differences between Indian and Burman leprosy are most marked. In Indians, leprosy of this type is usually diffuse and not localized, and not infrequently there is infiltration of the skin of the whole body without the presence of definite nodulation anywhere. In Burmans, however, this is much more rarely seen, and there is a far greater tendency to the production of marked local lesions without any apparent general skin involvement. Even when there is such a general involvement, marked nodulation in certain sites is a striking feature of the disease. Such cases are sometimes seen in India but not nearly so commonly as in Burmans. The term 'nodular', previously used of leprosy of the lepromatous type, is not open to much objection when applied to leprosy in Burmans.

I will quote a few cases, possibly rather extreme cases, but all indicating this tendency to localization of the lesions.

A male, aged about 35, showed marked nodules on one ear lobe and no other obvious sign of leprosy anywhere in the body (*see* plate XIII, figure 6).

A boy, aged 12, showed very marked nodulation on the face and some similar lesions elsewhere in the body but in between the lesions the skin appeared perfectly clear and there was no evidence of diffuse infiltration as would be seen in such cases in Indians. It would be rare

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to find such a severe case in an Indian boy of this age but in Burma such cases are very common.

A male, aged 18, showed a large plaque-like lesion on the back with very indefinite margins fading into the surrounding normal skin. There was slight sensory change in the lesion but no detectable nerve thickening. Smears from the lesions show an enormous number of bacilli. There was no other lesion visible in the body.

Another patient showed a similar lesion on the arm but here there was very definite evidence of a previous tuberculoid lesion since there was more anæsthesia and also definitely thickened cutaneous nerves.

The last two cases illustrate a finding commonly made in cases of leprosy in Burma, namely, the development of lepromatous change in lesions which apparently were previously of tuberculoid nature. This finding may help to explain the peculiar localization and distribution of lepromatous lesions seen in some patients.

4. *The significance of these findings*

Such findings as I have here reported indicate clearly, I think, that there are differences in the clinical manifestations and in the course of the disease in Burmans as compared with Indians, and suggest strongly that the Burman has much less natural resistance to leprosy than the Indian. I think that the findings also have an important bearing on treatment and prophylaxis. Results of treatment in cases such as I have described in Burmans will probably not be so good as in the milder cases seen in Indians. Even in Indian cases, treatment has very great limitations, and in Burman cases the limitations will be even more marked. The findings also emphasize the paramount importance of isolation in the control of leprosy in Burma. Even in India, with perhaps only 25 per cent of cases infectious and with a general population not highly susceptible to leprosy, isolation of infectious cases is regarded as the chief measure in prophylaxis. In countries such as Burma, where perhaps 50 per cent of cases are infectious, where the mild cases are more likely to become infectious, and where the people as a whole are probably more susceptible, the argument for isolation is even stronger.

5. *Causes of racial variation*

When we try to give a reason for racial variations of leprosy we step into the realm of conjecture for little is known of the subject. It has been suggested that climatic, social, economic and dietetic conditions may help to cause these differences. The influence of climate in producing these differences in Burma can be disproved by the fact that in this country, different races show leprosy in forms varying with the race, the climatic conditions being constant.

The diet of the average Burman is in many ways similar to that of the average Indian, being based on rice, but the average Burman seems to be better fed owing probably to food being more abundant. Also Burmans not being vegetarians probably have a more balanced diet with a greater protein and fat intake. One peculiarity of the Burman diet is the consumption of 'nappi', a stale fish product. (This fact reminds one of Sir Jonathan Hutchinson's theories in their various forms). It seems to me unlikely that diet is an important factor in causing racial differences.

The social and economic conditions of villages seem on the whole better in Burma than in India. The general health also does not seem to have any important influence on the problem. The great health problem of Burma is malaria, but, in the parts of Burma where leprosy is most common, malaria is less common than elsewhere.

Another possible cause of variations in leprosy in different races and countries is a variation in the pathogenicity of different strains of the causative organism. The evidence however is against this idea. Indians infected in Burma and other countries apparently develop the forms of leprosy characteristic of the disease in India.

Thus it appears that the lack of resistance to leprosy of Burmans is racial and hereditary.

Regarding racial resistance to leprosy little is known. Long endemicity of other diseases in any country is often followed by a gradual diminution in the incidence of the disease and in the severity of the symptoms. This is often attributed to the development of racial immunity. Can such a phenomenon be demonstrated in leprosy? It has been suggested that this is the reason why leprosy practically disappeared from most of Europe at the end of the Middle Ages.

The history of leprosy is uncertain, but it has been surmised that leprosy originated in Africa and spread early to India and later to the far east. It seems that there is a considerable amount of evidence to suggest that in Africa and in India the disease is generally seen in a relatively mild form, but that as one travels farther east one sees the disease in forms steadily increasing in severity. These are suggestions and not really proved facts. Can these ideas be proved? Is it possible that in countries and peoples which have more recently been infected, the disease shows itself in its severer forms owing to the lack of time for the development of racial immunity?

On the other side it may be argued that there is no proof that leprosy originated in Africa and spread to the far east *via* India; that leprosy has been prevalent for thousands of years in the far east, probably for far longer than it was prevalent in Europe, and that racial immunity, if it occurs at all, has already had adequate time to make itself felt in far eastern countries. It may also be argued that in recently infected countries (*e.g.*, Nauru), the disease does not necessarily appear in a severe form.

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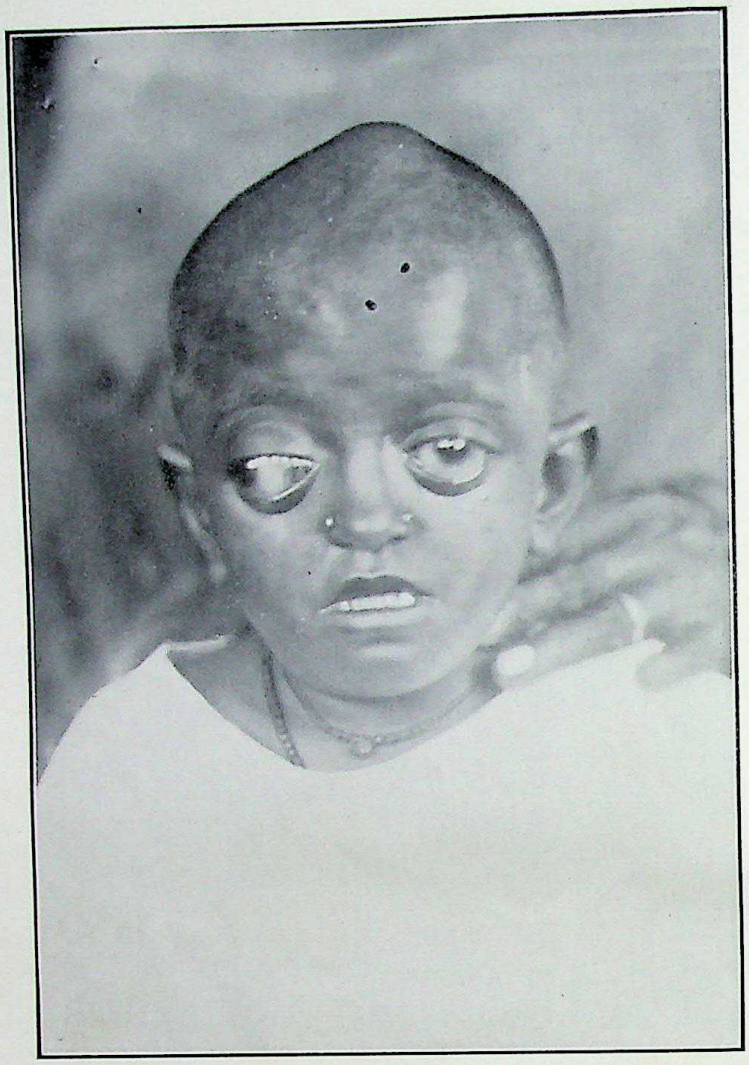
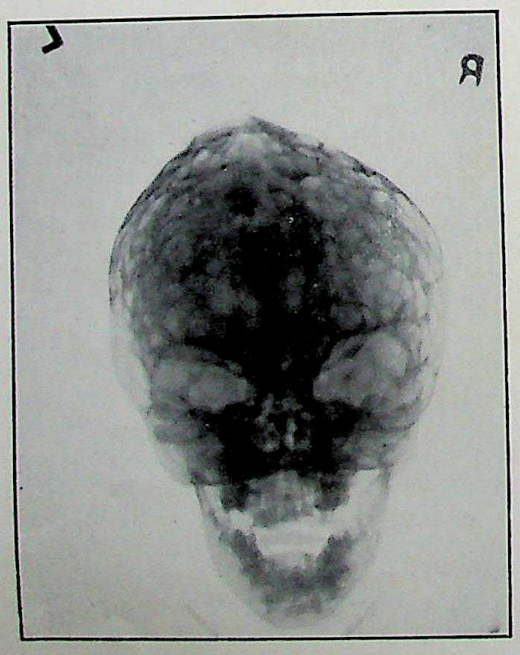
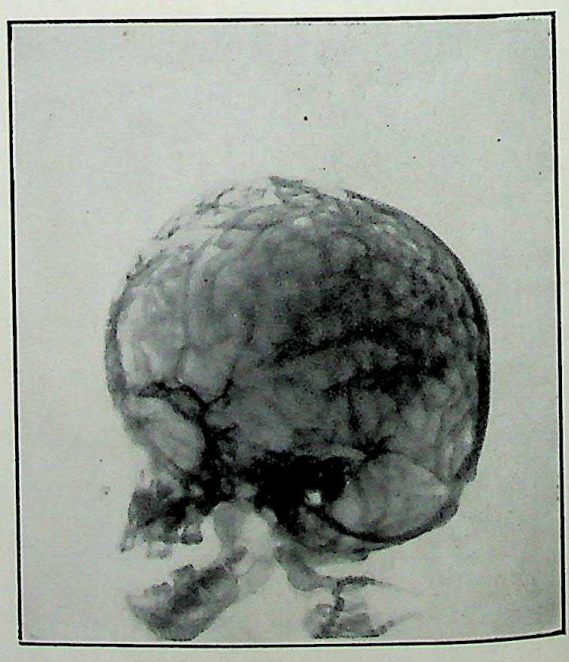
PLATE XIV







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OXYCEPHALY

By M. M. CRUICKSHANK
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THE comparative rarity of true oxycephaly and the difficulty in differential diagnosis may warrant the report of a single case.

A female child, aged 6, was sent to me for investigation as a case of possible intracranial tumour, and until certain investigations were completed the question of a Hands-Schüller-Christian syndrome was considered, but before final cranial measurements could be taken the child was removed from hospital.

The history, given by the grandmother, was that the child had been blind, if not from birth, at least before it was one year old, at which age protrusion of the eyeballs was noticed. The child had during the last 12 months suffered from periodical fainting fits, the nature of which could not be clearly elicited.

Family history revealed nothing of note. Father and mother alive and well; three elder sisters and one younger brother also alive, and presenting no abnormality.

The patient's birth, occurring at full term, had presented no difficulties. With the onset of the trouble, it was noted that the child breathed through its mouth, snored in its sleep and occasionally had a discharge from the nose. Two years ago, a swelling was noted on the top of the child's head. The condition, it was stated, had definitely progressed during the last one or two years.

Examination revealed a rather under-developed child with enlarged tonsils and adenoids. There was marked proptosis of both eyes forwards and slightly upward with a divergent strabismus. Pupils were dilated and inactive to light, the child groping its way around, but remarkably alert in guiding itself by the sound of voices. Eye movements were limited in all directions. The forehead was flat, almost vertical, and the skull culminated in a rounded peak at the bregma. The occiput was small and flattened. There were three protuberances on the skull over which the skin moved freely, the largest at the junction of the left parietal and frontal bones, the smaller ones over the left frontal and occipital regions. This observation suggested at first lipoid granulomatosis.

Muscular power and reflexes were normal; gait normal and no evidence of wasting. The hands were strikingly squat, the fingers being almost equal in length, the so-called trident hand. The child appeared happy but was definitely deficient mentally, being unable to talk properly and grimacing at intervals for no known reason.

The blood sugar was 0.067 per cent, urea 20 mgm. per cent, cholesterol 180 mgm. per cent.

Radiograms revealed well marked 'digital depressions' all over the skull, corresponding to the entire cerebral surface. The skull was sutureless and an ill-developed superior longitudinal sinus was noted. Sutures between the facial bones also were not visible. There was marked thinning of the calvarium and a definite absence of diploë though in a child of six or seven the formation of a diploic space has not normally advanced in any definite degree. The pituitary fossa was definitely malformed, appearing narrow and deep.

Greig (1926) in his exhaustive monograph on the subject of oxycephaly stresses the point that every misshaped head is not necessarily a case of oxycephaly, however vaguely it may simulate such a condition. He points out that confusion has arisen because of the want of differentiation between true, delayed and false oxycephaly, and he, with his wonted accuracy, defines true oxycephaly as 'a congenital malformation associated with synostosis and though there may be coincident developmental defects, presents as the constant feature a characteristic deformation of the skull'. True oxycephaly according to Greig is primarily a congenital defect, due to a general craniofacial synostosis often associated with other deformities, more often of the extremities. Delayed oxycephaly on the other hand is a premature general synostosis of the cranium manifesting itself in childhood but not associated with deformities of the extremities. In false oxycephaly, in contradistinction to the general synostosis of the true, the synostosis is limited to a few or even one suture, the facial sutures are never affected; the condition occurs during cerebral growth, is often of definite origin and is not congenital. In true oxycephaly the height of the head is an essential feature and depends on the fact that the membranous areas are kept open by the growing brain, but 'when and where the bones touch they fuse, the true oxycephalic skull is sutureless'. Greig stresses this point repeatedly, and states that 'this curious property is exercised during intrauterine life and the rapidity of brain growth during infancy produces an exaggerated deformity. In delayed oxycephaly the synostosis comes later and the deformity may be striking but need never become obtrusive'.

The alteration in size and shape of the pituitary fossa, well seen in some of the radiograms, is due according to Greig, to the small size of the basilar process, which is short and narrow. This feature Greig states is 'pathognomic of true oxycephaly and distinguishes it at once from all spurious varieties. It is the natural result of early fusion and cessation of growth'. Apparently the disturbance in shape of the fossa has no effect on the efficiency of the pituitary gland.

Though true oxycephaly is certainly not to be defined as a cranial deformity associated with exophthalmos, yet the eye symptoms, proptosis, nystagmus, and defective ocular movements are amongst the most important features of the condition. Dislocation of the eyeball, reported by several writers, is probably the result of the shallow orbits, and the proptosis

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It must, however, be accepted that racial differences in leprosy are seen. It is just possible that a study of racial susceptibility in relation to the history of leprosy in the affected races may give interesting results.

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CONVULSION THERAPY IN SCHIZOPHRENIA

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Schizophrenia (dementia præcox) is one of the most frequent forms of the major psychoses, constituting the majority of first admissions to mental hospitals, and, in view of the tendency to chronicity, and that, in many instances, it does not shorten life, it is usually found that about 60 per cent of the population in mental hospitals is made up of schizophrenics. It is a greater social menace than any other illness. Yet the average medical practitioner cannot even recognize it.

In its treatment many a will-o'-the-wisp which at first appeared substantial has been followed, but so many of them have turned out to be mere fancies that it is not surprising that psychiatrists adopt a conservative attitude towards any new therapy. According to some recent work done in Europe and the United States of America it is claimed that 'shock therapy' produces cures or remissions in early cases, and beneficial effects on long-standing cases of schizophrenia. Two methods are employed—the 'hypoglycæmic' by the use of insulin and the 'cardiazol' method.

Insulin method.—Dr. Isabel G. H. Wilson (1936), Medical Commissioner to the Board of Control (England and Wales), who studied the 'hypoglycæmic shock-treatment' of schizophrenia, as introduced by Dr. Manfred Sakel in Vienna, has issued a lengthy report. She concludes that the method merits ample clinical trial, and that it is neither too dangerous nor too unpleasant to be used in a serious disorder.

The technique of Sakel consists in giving progressive doses of insulin, from 20 units upwards, until a state of insulin coma lasting, on the average, about one and a half hours is produced. Patients are brought round by the administration of cane sugar (7 oz. sugar in one pint of tea) by the nasal tube, or by glucose (20 to 40 c.cm. 20 per cent solution) intravenously if the coma becomes too deep. Coma is produced thrice weekly for about five or six weeks. The patient is said to become more accessible, and psychotherapy is used in helping the patient to re-adjust.

Cardiazol method.—When Sakel in Vienna was investigating the hypoglycæmic method of shock therapy, Dr. Ladislaus von Meduna was experimenting with animals in the laboratory of the Royal State Mental Hospitals in Budapest. From clinical records and observations, von Meduna came to the belief that in the development of schizophrenia and epilepsy there exists a fundamental biological antagonism which can, by artificial means, be made to serve therapeutic ends. After much research he selected cardiazol as being the ideal drug to use for the production of the epileptic state. The drug is soluble in water, and can be used intravenously, intramuscularly, and subcutaneously. When used in the right quantity, and with sufficient rapidity a typical epileptic convulsion is produced in 10 to 90 seconds after the injection. In cases treated by the intramuscular route in this hospital the time varied from 5 to 90 minutes after the injection before the convulsion occurred. Cardiazol is not cumulative in its action, and, it is claimed, has no disadvantageous effect on the normal heart. The treatment to the onlooker may appear somewhat cruel and 'cold-blooded', but when the convulsion occurs the patient immediately becomes unconscious, and is later amnesic, just as if given a general anæsthetic for a surgical operation.

Schizophrenia is, moreover, an illness from which few patients, if any, recover spontaneously, and any treatment which holds promise

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having reached a certain point, the action of the orbicularis palpebrarum would, by exerting pressure behind the globe, tend to dislocate the eyeball forward.

Of the cranial nerves the second is the only one to be affected. The atrophy is the result of an antecedent papillœdema, occurring in early life. The pathogenesis of the optic atrophy seems to be in doubt. Greig states that 'intracranial pressure alone does not seem to be the cause of the optic neuritis and, in true oxycephaly, there is neither osteophytic growth nor thickening to narrow the optic canal. Indeed the usual disturbance seems to be brought about by a variety of causes acting together in which smallness of foramen and increase of intracranial pressure may take their share, but much more important is the upward deflection of the nerve with the displacement of the brain, the defective arterial blood supply and the restriction of the venous return'.

Though many anomalies may be present with oxycephaly, no single one is constantly represented. The only constant combination is that of cranial deformity and synostosis and these alone, as Greig puts it, constitute the syndrome of oxycephaly. Just as in achondroplasia, and later on in fœtal life in acromegaly, conditions presenting cranial deformities with associated deformities in the extremities, so in true oxycephaly the local fault occurs during intrauterine life, at the time when the fingers and later on the joints are being formed. The deformity of the digits is subservient to that of the skull.

I am indebted to Dr. Pillai, the Medical Superintendent of the Barnard Institute of Radiology, for the radiograms.

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of a cure, or even a remission, has ample justification. The treatment of many cases throws a very great strain on the medical and nursing staff of an institution, but nevertheless, if the claims of success are substantiated in such a hopeless illness as schizophrenia, the trouble and risk are worth while.

The nature of the treatment and the risks attached are fully explained to the relatives of patients, and before shock therapy is undertaken in this hospital the written consent of the relatives must be lodged with the medical superintendent. During the past six months the treatment has been offered to all early and a number of long-standing cases, and the consent of the relatives has been withheld in one case only.

One patient suffering from schizophrenia (simple) was successfully treated in this hospital by the insulin method, but the technique is difficult, and it was realized that the strain of treating large numbers with insulin would be too great to be undertaken with a medical and nursing staff which barely meets the routine requirements of the hospital. The work of investigators using the insulin method in Europe and America is reviewed in the *Year Book of Neurology, Psychiatry and Endocrinology*, 1937.

It was found, however, that a combination of insulin and cardiazol gave good results when cardiazol alone failed to produce convulsions. The practice in this hospital is to administer 20 to 50 units of insulin subcutaneously two hours before the cardiazol injection. The technique generally employed in this hospital is that of von Meduna and it is well described in his book *Die Konvulsionstherapie der Schizophrenie* of which a translated abstract is obtainable from Messrs. Knoll A.-G., Chem. Fabriken, Ludwigshafen a Rn., Germany.

The following notes are extracted from the case records of 26 patients treated during the first six months of 1938 :—

Case 1.—E. G., male, European, *æt.* 23, single, soldier. Admitted on 18th January, 1935. Certified. Talk irrelevant, delusions, auditory hallucinations, apathetic.

Diagnosis—schizophrenia—hebephrenic.

Treatment—period 1935–37 had three courses of pyrexial therapy—(1) sulfosin, (2) sulfosin with gold chloride, (3) pyrifer—resulting in institutional social adjustment.

Shock therapy (cardiazol) commenced on 1st February, 1938. Marked improvement after first injection. After fourth convulsion conduct and conversation normal. Had in all eleven induced convulsions. Treatment discontinued on 28th February. In view of the past history he was detained in hospital for a further three months.

Result—discharged recovered on 24th May.

Case 2.—N. I., female, Anglo-Indian, *æt.* 31, married. Admitted on 13th April, 1938. Certified. Displayed oddities, silliness, incongruity, mannerisms, impulsive outbursts, and attitudinizing. Conversation rambling—answered all questions in a very loud tone of voice. Persecutory ideas and ideas of reference.

Diagnosis—schizophrenia, simple.

Shock therapy (cardiazol) commenced on 22nd April. Very strong reactions. In all eight convulsions.

Result—discharged recovered on 24th May.

Case 3.—F. N., male, European, *æt.* 26, single, teacher. Admitted on 27th December, 1937. Certified. Displayed confusion, incoherence, verbigeration, disgusting habits, destructiveness, mannerisms of speech and action—lack of emotional tone, hallucinations.

Diagnosis—schizophrenia—catatonic (with excitement).

Shock therapy (cardiazol) commenced on 14th February, 1938. No reaction after first injection 5 c.cm. 10 per cent solution. Good reactions from second till ninth injections. No reaction after tenth injection 9 c.cm. 10 per cent solution. From the eleventh injection till the completion of the course, 40 to 50 units insulin were administered subcutaneously two hours before the intravenous cardiazol injections. Strong convulsions resulted with combined cardiazol-insulin therapy. In all ten cardiazol injections, and ten cardiazol with insulin.

Result—discharged recovered on 24th May.

Case 4.—D. E., male, Anglo-Indian, *æt.* 33, married, engine driver.

Admitted on 14th December, 1937. Certified. Looking ill. History of insomnia, loss of appetite, depression, lack of energy, ambition, and interest in his work. Delusions of persecution, personal unworthiness, hallucinations, indifferent and apathetic to his environment; gazes vacantly into space; answers irrelevant. In the words of his wife: 'he became a recluse, utterly indifferent to his family and his friends, expressed no desires, reacted to nothing, and even failed to take his food'.

Diagnosis—schizophrenia—catatonic (with depression).

Shock therapy (cardiazol) commenced on 2nd March, 1938. Showed early improvement. In all ten convulsions.

Result—discharged recovered on 24th May.

Case 5.—R. L., male, Anglo-Indian, *æt.* 26, single, student.

Admitted on 21st October, 1937. Certified. Looking ill, history of gradual mental deterioration—apathy and emotional dullness—confused: mannerisms; no delusions or hallucinations elicited.

Diagnosis—schizophrenia, simple.

Was given a course of pyrexial therapy but showed no improvement.

Shock therapy (insulin) commenced on 7th January, 1938. 1st dose 25 units—gradually increased daily until 75 units were given. This appeared to be the requisite dose in this case to produce coma. This dose was given thrice weekly until 14th February. Developed a severe attack of facial herpes. The herpes cleared up under orthodox treatment. Mental conditions greatly improved.

On 9th March, it was decided to re-commence shock therapy but in view of the heavy strain thrown on the medical staff by the use of the insulin method the patient was treated with cardiazol. Had eight induced convulsions by cardiazol.

Result—discharged recovered on 24th May.

Case 6.—L. C., male, Anglo-Indian, *æt.* 22, single, pointsman.

Admitted on 31st January, 1938. Certified. Boisterous, violent, verbigeration. To all questions replied 'exactly', destructive; delusions.

Diagnosis—schizophrenia—hebephrenic (with manic attacks).

The manic attacks were controlled by hydrotherapy. The relatives at first refused to permit shock therapy. Patient showed slight improvement after a course of pyrexial therapy (sulfosin). Later, the relatives consented to shock therapy. Cardiazol was commenced on 28th February. Reactions good. In all 15 convulsions. In the last six the cardiazol injections were preceded by insulin 50 units subcutaneously, the insulin being administered two hours before the cardiazol.

Result—discharged recovered on 21st April.

Case 7.—K. C., female, Anglo-Indian, *æt.* 29, single, typist.

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Admitted on 22nd May, 1937. Voluntary boarder, displayed antics, mannerisms, emotional deterioration, senseless laughter.

Diagnosis—schizophrenia—hebephrenic.

Improved under a course of sulfosin. Institutional adjustment. Commenced cardiazol therapy on 18th January, 1938. Reactions good—showed early improvement. In all eleven induced convulsions.

Result—discharged recovered on 8th April, 1938.

Case 8.—G. N., male, European, *æt.* 35, widower, mess steward.

Admitted on 14th February, 1938. Certified. Apathy without expression of delusions and hallucinations. Had many jobs, inability to adjust in any of them. Vague and indefinite paranoid ideas. Well oriented for time, place and person. No defects of memory for remote or recent events. Disliked occupational therapy.

Diagnosis—schizophrenia, simple.

Shock therapy (cardiazol) commenced on 11th March. Reactions good. In all four induced shocks.

Result—discharged recovered on 23rd March.

Case 9.—E. S., female, European, *æt.* 27, single.

Admitted (transfer from Lahore) on 14th February, 1936. Certified. History admitted to Lahore Mental Hospital on 27th March, 1935.

Diagnosis—dementia præcox (simple).

Had several courses of pyrexial therapy (sulfosin) with no apparent improvement. Shock therapy (cardiazol) commenced on 2nd March, 1938. Had six intravenous injections ranging from 4 to 6 c.cm. 10 per cent solution cardiazol. Good reactions. Intravenous route difficult. Seventh and subsequent convulsions induced by intramuscular route (6 c.cm. of 30 per cent solution cardiazol). In all 14 induced convulsions. Greatly improved socially. Commenced to take interest in singing, dancing and painting but continued to have outbursts of senseless giggling.

Result—improved, socially better; institutional adjustment and now good and steady worker. Not fit for discharge.

Case 10.—C. R., female, Anglo-Indian, *æt.* 34, married.

Admitted on 8th June, 1935. Certified. Grandiose delusions, visual and auditory hallucinations + +.

Diagnosis—schizophrenia—paranoid type.

Showed no improvement after several courses of pyrexial therapy (sulfosin and pyrifer).

Shock therapy (cardiazol) commenced on 21st February, 1938. In all fifteen induced convulsions. Delusions and hallucinations did not recede—treatment discontinued.

Remarks—improved socially, and took more interest in diversion therapy and adjusts better to institutional life. Not fit for discharge.

Case 11.—B. N., female, European, *æt.* 27, single, typist.

Admitted on 8th June, 1937. Certified. Apathetic, disinterested, conversation disjointed, mannerisms.

Diagnosis—schizophrenia—hebephrenic.

Showed no improvement after pyrexial therapy (sulfosin).

Shock therapy (cardiazol) commenced on 7th February, 1938. Had 12 induced convulsions. Only showed slight improvement. Treatment discontinued on 9th March, owing to anæmic condition.

Remarks—slight improvement. To be considered for further treatment when physical conditions improved.

Case 12.—H. T., male, European, *æt.* 37, married, missionary.

Admitted on 25th November, 1937. Certified. Noisy, excitable, mannerisms, purposeless actions, destructive, shameless masturbation—aggressive—delusions and hallucinations.

Diagnosis—schizophrenia—catatonic (with excitement). Manic condition controlled by hydrotherapy and sedation. Relatives at first refused to permit shock therapy. Improved slightly after a course of pyrexial therapy (sulfosin). Manic state disappeared and he became apathetic. Relatives consented to shock therapy. Cardiazol injections commenced on 23rd March, 1938. Had 16 typical convulsions. Treatment discontinued on 16th May.

Remarks—slight improvement. To be considered for a second course after a period of rest.

Case 13.—A. D., male, Indian, *æt.* 24, single, student.

Admitted on 4th March, 1936. Certified. Mute and timid, sat crouched up in the corner of his ward. Refusing food, furtively watching all that went on around him. Physical health poor. Weight 99 lb. Showed slight improvement after a course of pyrexial therapy. Made a determined suicidal attempt on 7th September. Course of photodyne given in 1937 with no apparent improvement. Condition on 8th March, 1938, mute, apathetic and under constant supervision.

Diagnosis—schizophrenia—catatonic (with depression).

Shock therapy commenced on 8th March. Had 20 induced convulsions. Treatment discontinued on 12th May.

Remarks—patient showed much improvement, commenced talking, painting and sketching. Can do fairly difficult arithmetic sums correctly. Still apathetic and asocial. Attends physical culture and takes only walking exercise—working well—making a rug of intricate pattern.

To be considered for a second course after a period of rest.

Case 14.—G. G., male, Anglo-Indian, *æt.* 27, single, no occupation.

Admitted on 3rd July, 1936. Certified. Dull, mute, lethargic, will remain standing in one place for long periods, no co-operation. Gestures, grimacing, and grinning.

Diagnosis—schizophrenia—catatonic (with depression). Two courses of pyrexial therapy (sulfosin). No appreciable improvement.

Shock therapy (cardiazol) commenced on 14th March, 1938. Discontinued on 23rd April. In all 16 convulsions.

Remarks—no improvement mentally, although patient has been working steadily in the carpentry section since.

Case 15.—N. N., female, Jewess, single, housewife.

Admitted on 2nd August, 1937. Certified. Impulsive—overactive—aggressive and makes sudden attacks on inoffensive bystanders. Delusions, auditory and visual hallucinations.

Diagnosis—schizophrenia—catatonic (with excitement). Slight improvement after hydrotherapy and pyrexial course (sulfosin).

Shock therapy (cardiazol) commenced on 16th February, 1938. Had two typical reactions. Patient became very excitable and troublesome, and refused to complete the treatment.

Remarks—the delusions and hallucinations are still very prominent, but her behaviour has greatly improved. She was formerly a most troublesome patient but now quiet and a good and steady worker (machinist).

Case 16.—N. D. R., female, Anglo-Indian, *æt.* 23, single.

Admitted on 20th July, 1936. Voluntary boarder. Father, a medical man, stated: 'patient had been suffering from dementia præcox for a few years'. Answers simple questions and giggles to herself for no apparent reason. Dirty and perverse habits—passes urine and fæces in bed.

Diagnosis—schizophrenia—hebephrenic.

Showed no improvement after sulfosin, photodyne and insulin treatment. Deteriorating rapidly.

Shock therapy commenced on 21st February, 1938. In all 20 convulsions.

Remarks—no improvement. Became extremely violent and destructive. Still deteriorating.

Case 17.—P. N., female, Anglo-Indian, *æt.* 24, single.

Admitted on 22nd June, 1936. Certified. Pregnant six months. Aggressive, abusive, negativism and automatism prominent features with outbursts of senseless laughter.

Diagnosis—schizophrenia—catatonic (with excitement).

Excitement controlled by hydrotherapy—gave birth to a healthy male child on 29th March, 1936. Antagonistic towards infant. Continued to have frequent outbursts of excitement, language obscene, senseless laughter.

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troublesome, aggressive and irresponsible. Somatic delusions +.

Shock therapy (cardiazol) commenced on 28th February, 1938. Good reactions. Results dramatic. Improved greatly after first convulsion. Had six convulsions.

Remarks—discharged recovered 22nd March.

Case 18.—V. T., female, American, *æt.* 34, married, missionary.

Admitted on 12th November, 1937. Certified. Early diagnosis of manic, depressive psychosis. Noisy, aggressive, obscene, erotic flight of ideas. No improvement after hydrotherapy, sedation, and prolonged narcosis. Later schizophrenic background suspected. Mannerisms, verbigeration, senseless laughter.

Diagnosis—schizophrenia—catatonic (with excitement).

Shock therapy (cardiazol) commenced on 18th March, 1938. Showed marked and early improvement. Treatment discontinued after eighth convulsion on account of fever and tachycardia. Relapsed mentally with extreme catatonic excitement (following visit from husband). Hydrotherapy required to control excitement. The patient is improving mentally and physically.

Remarks—to be given another course of cardiazol therapy as soon as physical condition warrants it. Prognosis good. On 5th May recommenced cardiazol therapy. Had three convulsions.

Result—discharged recovered on 28th June.

Case 19.—M. N., female, Anglo-Indian, *æt.* 30, single.

Admitted on 24th May, 1927. Certified. Long-standing case of schizophrenia exhibiting frequent outbursts of catatonic excitement (sister of case 17).

Shock therapy (cardiazol) commenced on 2nd May, 1938, at request of her sister (case 17). Had five strong convulsions. Showed slight improvement but treatment was discontinued owing to violent antagonism of patient.

Remarks—no permanent improvement. Has recently had frequent outbursts of catatonic excitement.

Case 20.—R. I., female, Anglo-Indian, *æt.* 33, married.

Admitted on 5th July, 1937. Certified. Long-standing case of schizophrenia with mental deficiency (first admission on 11th October, 1930). Frequent outbursts of catatonic excitement. Delusions and auditory hallucinations + +.

Shock therapy (cardiazol) commenced on 2nd May, 1938. Three convulsions appeared to accentuate the delusions, hallucinations, and excitement.

Remarks—in view of the superadded mental deficiency and the patient's marked objection to the treatment the course was discontinued. No improvement.

Case 21.—D. H., female, Anglo-Indian, *æt.* 33, married.

Admitted on 16th February, 1933. Certified. Destructive, dirty in habits, delusions and auditory hallucinations.

Diagnosis—schizophrenia—catatonic (with excitement). No improvement with pyrexial therapy.

Shock therapy (cardiazol) commenced on 31st March, 1938. Twenty convulsions.

Remarks—social improvement, but delusions and hallucinations still prominent. Conduct greatly improved, and taking an interest in diversion therapy.

Case 22.—F. C., male, Anglo-Indian, *æt.* 37, married, clerk.

Admitted on 17th March, 1935. Certified. Impulsive, destructive, refusing food, mute, disorientated, says his age is 75.

Auditory hallucinations + +.

Diagnosis—schizophrenia—catatonic (with excitement).

Improved after hydrotherapy and pyrexial therapy—became a good worker (carpentry) but remained apathetic and exhibited no interest in his wife and child. Frequent outbursts of senseless giggling.

Shock therapy (cardiazol) commenced on 14th March, 1938. Appeared to improve, conversed rationally. Discussed his discharge from hospital and future plans—said he would return to his father, but not to his wife and child.

Remarks—had 16 induced convulsions. Appeared to be terrified of them, so they were discontinued. Returned to carpentry where he was working well. On 2nd May had a sudden and acute relapse—condition similar to that on admission. Excitement controlled by hydrotherapy. Returned to work ten days later. Reports good—but still apathetic and disinterested.

Case 23.—E. P. I., male, Anglo-Indian, *æt.* 21, single, telegraphist.

Admitted on 7th June, 1934. Emotional, responses shallow and inadequate, apathetic, delusions, and auditory hallucinations. Impulsive, aggressive.

Diagnosis—schizophrenia—hebephrenic type. Several courses of pyrexial therapy (sulfosin, solganol, sodium nucleinate, pyrifer). No improvement.

Shock therapy (cardiazol) commenced on 18th March, 1938. In all 18 convulsions.

Remarks—showed marked improvement. Conversation brighter, and more sociable with staff and patients. Working well in cane section. To be allowed out on *parole* when his relatives find it convenient to take him.

Case 24.—H. C., male, Anglo-Indian, *æt.* 35, single, preventive officer.

Admitted on 2nd April, 1931. Certified. Mute, resistive, catatonic depression, unsociable and seclusive (brother of case 7).

Diagnosis—schizophrenia—catatonic (with depression). Had several courses of pyrexial therapy with no effect.

Shock therapy (cardiazol) commenced on 2nd May, 1938. In all 13 convulsions.

Remarks—no improvement. Treatment discontinued.

Case 25.—A. C., male, Indian, *æt.* 19, single, student.

Admitted E. M. H. on 14th August, 1936. Discharged improved on 14th October, 1936. Next seen on 4th January, 1938. A quiet boy who never entered into rough games. Excellent school record, always stood high in his class until illness in 1934 (? meningitis). Asthenic physique, apathy, preoccupation and inactivity. Never expressed any delusions and denied hallucinations. Given a course of pyrexial therapy (sulfosin) with some improvement, but still deficient in attention and concentration.

Diagnosis—schizophrenia, simple.

Shock therapy (cardiazol) commenced on 5th April, 1938. Showed early and marked improvement. Commenced to write long and sensible letters to his relatives—rang them up on the phone frequently. Commenced to take an interest in himself and surroundings—took up tennis, boxing, and physical culture. Co-operated well. Begged that the cardiazol be discontinued after the ninth injection as he was 'perfectly cured'. Had a course of psycho-therapeutic sessions for one month after the shock therapy.

Remarks—recovered—now studying shorthand and typewriting.

Case 26.—P. L., male, Indian, *æt.* 27, clerk, married.

First seen on 23rd March, 1938. History—brilliant school and college career. Appeared for I.C.S. examination in U. K. This was followed by 'serious type of nervous breakdown'. Returned to India. From 1922 to 1938 history of three attacks. Given several courses of Roy's pills and many other medicines, but condition 'got from bad to worse'. Refusing food, suspects poison in almost everything. Sometimes laughs and sometimes weeps—seclusive.

Seen first on 23rd March. Negativistic, resistive, violent delusions, auditory and visual hallucinations.

Diagnosis—schizophrenia—catatonic (with excitement).

Cardiazol therapy commenced on 24th March, 1938. First eight injections by intravenous route, 5 c.cm., 5 c.cm., 5 c.cm., 6 c.cm., 6 c.cm., 7 c.cm., 7 c.cm., 8.5 c.cm. of 10 per cent solution. Difficult veins and patient aggressive—subsequent administration intramuscularly (30 per cent solution of cardiazol), 9 c.cm., 9 c.cm., 10 c.cm., 10 c.cm., 10 c.cm. No apparent improvement. On 2nd May, 1938, commenced a course of pyrexial therapy (sulfosin). Had 10 injections—some improvement. On 10th June commenced cardiazol injections again by the intravenous route. Had five major convulsions up to 23rd June. Marked improvement.

Remarks—prognosis good.

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Before the treatment is commenced a thorough physical examination is necessary. The following are definitely contra-indications :—

(1) Evidence of cardiovascular disease, (2) abnormalities in laboratory findings, (3) acute febrile infections, (4) history of head trauma with subsequent unconsciousness, (5) tuberculosis, and (6) menstruation.

Summary.—Of the 26 cases treated 11 made complete recovery and on discharge by the committee of visitors showed no evidence of psychosis. Ten showed improvement and five showed no improvement. In at least two of the 10 cases which showed improvement the prognosis is good, and a second course of treatment has been commenced.

Of the 11 cases which recovered, three were less than three months under treatment in hospital, three less than six months, three less than 12 months. One patient was in hospital for one year and nine months and another three years and four months. Every case treated with less than six months' history recovered. All cases with less than 12 months' history improved, and 50 per cent recovered. These figures indicate the importance of early diagnosis and early treatment.

I am of the opinion that the treatment of schizophrenia by shock therapy alone cannot be successful. The psychiatric treatment is very important. In this hospital the patient is given a psychotherapeutic session the day after every convulsion—the mental sensations and any changes in the mental condition are fully discussed. In addition the resources of the hospital for occupational diversion, physical culture and recreation are freely utilized for the benefit of the patient.

In none of the above series of cases was the treatment followed by any alarming physiological results.

Many ramifications of the theory in the treatment of schizophrenia by shock therapy are possible, but it is not the intention to discuss them here. 'The most important factor in medicine is therapeutic success. It is of greater moment than all special investigations, be they ever so exact, than all ingenious theories'.

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SUSPECTED BOTULISM : A REPORT ON TWO CASES

By COLIN D. TORPY, M.M.F. (B.), I.M.D.

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Botulism (from the Latin *botulus*, a sausage), or ichthyosismus, as it is otherwise described, is a disease produced by the ingestion of the toxin elaborated by the growth in food products of *Clostridium botulinum*, an anærobic spore-bearing bacillus having as its natural habitat the soil.

Botulism is by no means a common disease. In the U.S.A. and Canada 146 outbreaks have been reported affecting 504 persons of whom 337 died, a case mortality of 67 per cent. These outbreaks were spread over a period from 1899 to 1925. In Germany 24 outbreaks of suspected botulism have been reported from 1907 to 1923. In the British Isles, only three outbreaks are on record, the largest of which occurred at Loch Maree in Scotland, where 8 persons were affected from eating potted duck paste and all died within a week, *Cl. botulinum*, type 'A', being isolated from the remnant of the paste. More recently 'vegetable brawn' was responsible for the London outbreak of 1935.

The type of food most likely to cause the disease is smoked, pickled or canned food that has been allowed to stand for some time before cooking, or probably after inadequate cooking. Vegetables such as beans and peas, fruit such as olives, and meat such as sausages, ham or potted goose or duck, are the foods mainly responsible. In several cases those who have consumed the affected food after cooking have escaped the infection, whereas those who consumed it prior to cooking have generally been affected.

It has been definitely established that botulism is an intoxication and not an infection. The causative organism, *Cl. botulinum*, multiplies in the food before it is consumed, and produces a powerful soluble toxin, which on ingestion is absorbed by the mucosa of the stomach and upper part of the intestine (its ability to pass through the mucosa unchanged differentiates it from tetanus or diphtheria toxin) giving rise to the characteristic disease. Edmunds who has done a great deal of work on its toxicology

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suggests that the action of the toxin is not, like that of tetanus, directly on the neurons, but on the motor-nerve endings of voluntary muscle, *i.e.*, it resembles that of curare with, in addition, a milder effect on the para-sympathetic system.

The incubation period is stated to be generally under 24 hours after the consumption of the affected food, but this period may quite easily be prolonged from 72 to 96 hours.

Prominent among the symptoms are blurring of vision and dizziness; nausea, vomiting, and obstinate constipation; inability to swallow, with a sense of constriction and dryness in the throat; abdominal cramps and pains; diplopia, photophobia, and lachrymation follow rapidly while a feeling of extreme muscular weakness may appear very early. The general consciousness and sensibility remain intact till the end, sometimes preceded by coma and delirium. The temperature and pulse rate usually remain normal unless complications set in. Death may take place within 24 hours of the onset of the disease and usually not longer than a week. In the very severe cases that survive, complete recovery, particularly in the ocular movements and the paralysis of the muscles of the lower extremities, may not take place for six or eight months.

As far as I am aware no cases of botulism or suspected botulism have so far been recorded from India. This, however, is not the only reason why I am taking the opportunity of recording these two cases that have come under my notice, but because they present many features of interest, some of which do not appear to have been met with or described in previous recordings.

Before the 12th May, 1937, Misses 'A' and 'B', aged 21 and 20, sisters, were in the best of health. On that day, they both attended with many others a cold supper and dance held in honour of His Majesty's Coronation. Both girls stated that shortly after they had started dancing (which was about an hour after the supper) they felt unusually tired, and complained of vague aching pains in the head and the limbs. The next morning 'A' complained of pains in the chest, arms, and lower limbs, while 'B' complained of pains in the lower limbs only.

On the following day, a doctor was called in and they were treated as suffering from 'influenza', the pains being acute on this day, and the disease prevalent at the time, but there does not appear to have been any fever, nor was their condition such as to excite any apprehension whatever. On Saturday (15th May) both girls felt much better except for slight pains in the head with slight blurring of vision. On Sunday, they had recovered sufficiently to get up and go about their ordinary occupations. On Monday morning there was apparently no trace of discomfort but it is noteworthy that both girls, who previously had never any trouble with their bowels, were now and had been obstinately constipated since the 12th May. On Monday night they attended a cinema and both complained when they had returned home of aching pains in the limbs that prevented them from falling off to sleep. In the morning they both felt quite ill, and 'B' was unable to get out of bed, while 'A' was just able to do so, and a slight drag of her right leg was noticed as she walked about. 'B' complained of a severe, sharp, lancinating pain which she appeared to localize from the vagina upwards. A medical man was summoned: 'B' was found to be paralysed from the waist downwards, while 'A' was found to be paralysed only in certain groups of muscles of the right leg and thigh. There was a mild degree of pyrexia and nothing else of note. They were both removed to the local hospital, and on Wednesday their condition appeared to be unaltered. On Thursday, as the paralysis could not be satisfactorily accounted for, a second medical opinion was obtained.

It is a point of great interest that four or five of the other members at the same supper party from the same table complained of pains in the limbs, and general malaise the next day, and it is also worthy of note that 'A' and 'B' being strict teetotallers did not partake of any alcohol, whereas the rest of the party had consumed alcohol. The supper consisted of cold meat with salad in which a tin of peas had been incorporated. The tin of peas had not been heated prior to consumption.

On Friday, 21st May, 'A' became very ill. There was great difficulty in swallowing; air-hunger was present; pulse quick, feeble, and thready; abdomen acutely distended; bowels inactive; face, mask-like, pale with drooping eyelids; inability to see anything properly; diplopia present; only black shadows seen in room; consciousness intact and maintained. The rapidity in the breathing continued, and the diaphragm was seen to fail, and respiratory embarrassment became very severe, and, in spite of all treatment, 'A' died of respiratory failure, fully conscious to the end.

'B' was brought to Calcutta and admitted to the Presidency General Hospital on 22nd May.

On examination, patient of good physique, looks healthy. Oral hygiene, excellent; tongue, clean and moist. Chest, clear; heart sounds normal. Abdomen held rigid and difficult to palpate; bladder, distended and requires frequent catheterization; bowels, constipated, and open only with purgation.

Pupils equal, reacting to light and accommodation. No nystagmus, but diplopia present with haziness of vision.

Superficial abdominal reflexes, brisk, while the knee and ankle jerks are sluggish; sensory system, unaffected; abdominal muscles act normally; psoas and lumbar muscles unaffected; gluteus medii on both sides function feebly.

Paralysis of muscles of both extremities present with the exception of the flexor muscles of metatarsals of both feet.

Lumbar puncture carried out; cerebro-spinal fluid, clear and not under increased pressure. Globulin +; polymorphonuclear leucocytes 30 per cent; culture, normal.

Ophthalmoscopy—Fundi, normal.

A provisional diagnosis of 'botulism' was made and patient treated accordingly.

The chronic constipation continued for about two weeks after admission to hospital, and gradually cleared up with laxatives. The patient was practically apyrexial throughout her stay in hospital, and even after three months since the onset of disease the paralysis has not cleared up, though the muscles are responding to massage, galvanism, and faradism.

Discussion

W. M. Scott, Medical Officer of the Ministry of Health, writing on botulism in the *British Encyclopædia of Medical Practice*, volume II, says 'Proof of botulism in an individual patient or in an outbreak depends on the demonstration either of the bacillus itself, or of its specific toxin in the suspected food material. In the absence of such demonstration the detection of the bacillus in the excreta of the patient or in his body, *post mortem*, would constitute strong corroborative evidence of clinical suspicion'.

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Unfortunately in both these cases such proof is not available as both of them presented at the beginning of the disease such atypical features that a diagnosis of botulism did not seem likely, and, thus, much valuable material for the laboratory which 'is the final court of appeal in suspected botulism' was lost or not taken advantage of. Clinical diagnosis has had therefore to be relied upon in these two suspected cases, and there are many factors which point to such a finding being the correct one.

Both affected persons were attacked simultaneously, and were in the same group of people who shared the same food. Other members of the party were also obviously attacked, though admittedly to a much milder degree. Those who were so mildly affected happened to be people who consumed alcohol at the supper party, whereas the two who were severely affected were teetotallers. This is important and interesting as alcohol, it has been established, denatures the botulinum toxin, and prevents intoxication taking place.

A tin of peas, which was not heated prior to consumption, it is known, was used and had been incorporated in the cold salad eaten by all the members of the party, and there is strong presumptive evidence of it being the vehicle which carried the toxin.

The obstinate constipation, a characteristic feature observed in all cases of botulism, was present in both these cases, and was a marked feature of their disease.

The early symptoms, dimness of vision, diplopia, ptosis, photophobia, and lachrymation followed later by dysphagia, abdominal cramps, and still later by marked dyspnœa, and then, finally, with possession of all the mental faculties unimpaired, by death in the case of 'A', constitute a typical clinical picture of botulism.

'B', a less severe case, presents a much more modified and atypical clinical picture, and in her case, the paralysis of the muscles of the lower extremities is a most unusual feature of botulism, and if taken alone would lead one to make a diagnosis of poliomyelitis, except for the fact that the characteristic tenderness and stiffness of the neck seen so persistently in that disease was conspicuous by its absence in this case. In addition, it is not common to get two cases simultaneously infected with poliomyelitis in the same family, though in case 'B' it must be admitted that the fact of some permanent paralysis remaining on recovery, points to an acute poliomyelitis but this again is rendered the unlikely cause as there was even in case 'B' early involvement of the muscles supplied by the cranial nerves, which are seldom or never involved in poliomyelitis.

In concluding, I take this opportunity of thanking Major J. C. Drummond, I.M.S., the then Officiating Surgeon Superintendent, Presidency General Hospital, Calcutta, for his permission to publish these notes, and to Dr. F. E.

(*Continued at foot of next column*)

A CHOLERA EPIDEMIC IN SWAT STATE, N. W. F., 1937

By C. J. HASSETT
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In August this year an epidemic of cholera occurred in Swat State, Malakand Agency. This account may be of interest as cholera is not endemic in this province and no permanent foci of the disease are known to exist.

It is always imported from outside, generally by *Powindah* families when they are returning to Afghanistan through the province from India proper. Generally, these families are the first to suffer but in this instance the disease was solely confined to the population of Swat State. No cases occurred in the migratory population. At the same time cholera was not prevalent in the Punjab; only a few cases had occurred which were obviously importations from outside that province.

Epidemiology of the epidemic

The N. W. F. Province remained free from cholera until 6th August this year when the present epidemic began with explosive suddenness. The outbreak was first reported from Mingora town which is the principal trading centre in Swat State. On 6th August four cases occurred in one family in this town, all of which died. Next day it was reported that 25 more cases had occurred with 15 deaths.

The affected area was visited and the family in which the first cases occurred was interviewed. The sudden manner of the outbreak pointed to its being water-borne. The father of the family stated that he was obtaining his water from a *nullah* running north-west of the town, which takes off from the Swat river about one and a half miles away. Subsequently 20 more cases were seen and all reported that their water had been taken from this *nullah*. Secondly, all the cases seen were to the north-west and east of the town and were scattered about in various places in this area. Most of the families attacked had no contact with each other, thus eliminating house-to-house infection. Thirdly, there were no cases then or on the following three days in the south or south-west of the town. Most of the population in this area obtained their water from a large spring which was due

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Laborda, Chief Medical Officer, the East Indian Railway, Calcutta, for supplying me with the detailed information regarding the history of case 'A' without which a diagnosis of botulism in case 'B' would have been extremely difficult, if not impossible.

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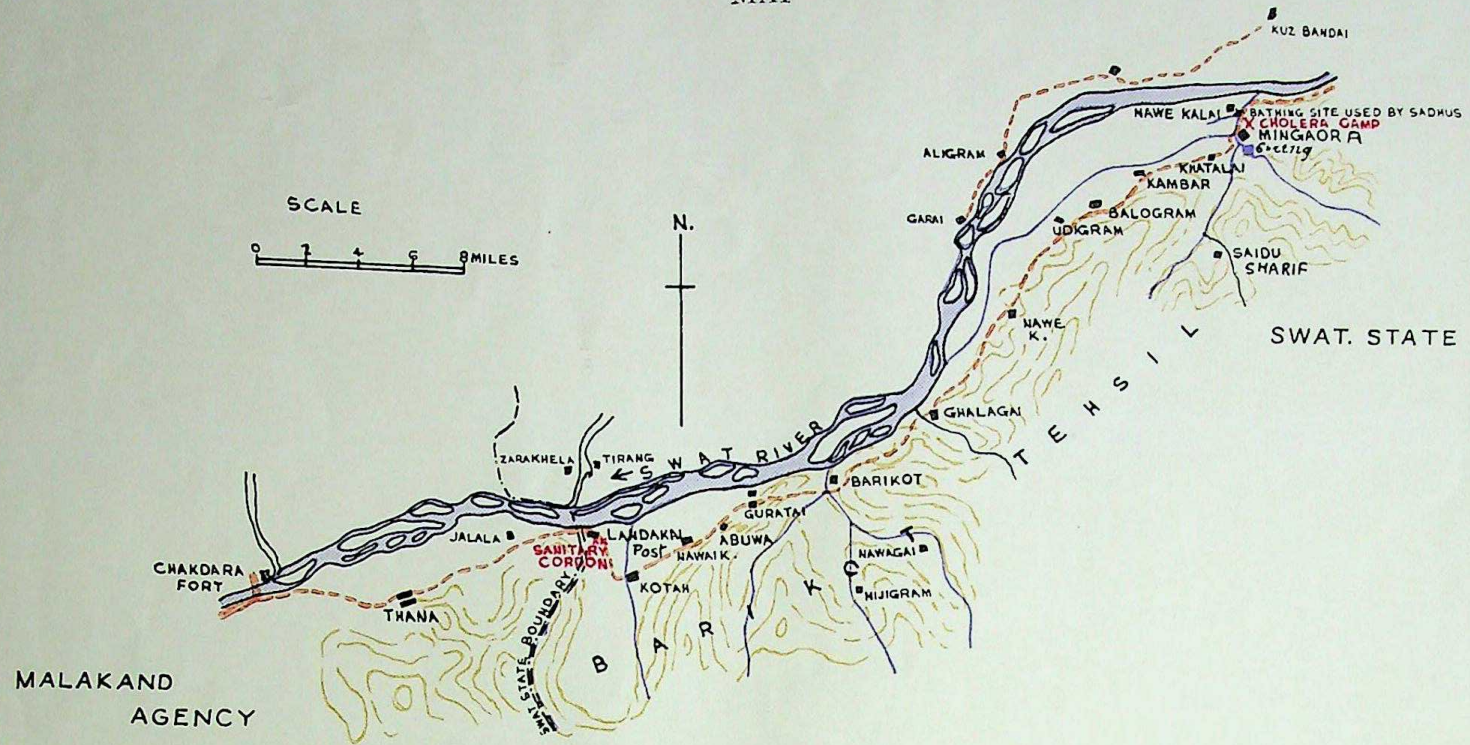

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south of the affected area. All evidence pointed to the above-mentioned *nullah* as being the source of infection. Later, a greater concentration of attacks subsequently occurred the nearer one got to this stream. The reason given for using the *nullah* water was that it was cold, as snow water is coming down from Swat Kohistan at this time of the year, and, secondly, the household wells had become brackish at the onset of the hot weather. The problem then was how had the stream become infected, as cholera is not endemic in this province? It is generally imported from outside, namely, the Punjab and the United Provinces. We then endeavoured to find out if any other cases had occurred in villages above this stream. There was only one village, Nawe Kalai, on the stream. It may be seen in the sketch map appended. In this village there were no cases of cholera although when visited several 'cholera' cases were shown which were mostly malignant malaria and dysentery. During the whole of the epidemic no cases occurred there.

It then transpired during the course of a conversation with a local *tehsildar* that a large number of Hindu *sadhus* had been visiting Swat State from the end of May onwards. They had come from down country. Their objective was Ilm, a mountain 9,000 feet high near Mingora town. A number of them had stayed in June and July in Mingora *dharamsala* and with the only three or four Hindu families in the place. This *dharamsala* was visited and the people there questioned as to whether there was any illness among them. We were informed that there was none. Then we endeavoured to find where these *sadhus* took their baths, and the keeper of the *dharamsala* accompanied us to the stream first suspected. It was above Mingora town and below Nawe Kalai village where up to now no cases had occurred. The site on the stream was opposite a divarication which led to the rice-fields. Here the *sadhus* took their baths. The question may be asked how did cholera only occur in Swat if it was brought up from the Punjab or the United Provinces, and no cases occurred in the Peshawar valley on the way up? Evidently a carrier or carriers were the cause of this outbreak and the *sadhus* were the innocent cause, as cholera seldom starts in the Mussulman population at the outset of an epidemic. Tomb and Maitra (1927) after researches in the Asansol mining settlement in Bengal state that the endemicity of cholera in any locality depends primarily upon the existence in the community of numbers of healthy carriers of non-agglutinating vibrios and upon the contamination of drinking-water supplies in a widespread and continuous manner with these non-agglutinating vibrios, which become in time converted into the agglutinating form owing to climatic conditions. No permanent carrier of agglutinating vibrios was ever found but 80 per cent of cholera convalescents were found to be carriers of the non-agglutinating form. They concluded that non-agglutinating vibrios are the reservoir of cholera, both epidemic and endemic, and that mutation of these occur under certain bio-chemico-physical conditions in the human intestine. Thus these non-agglutinating vibrios seem to have been introduced into the drinking-water supplies of the people of Mingora by the pilgrims from the South bathing in these water-supplies some time previous to the outbreak of the epidemic. All evidence adduced seems to show this surmise to have been the correct one. No bacteriological examinations of the water could be carried out for the presence of these vibrios as we were more concerned with preventive measures to control the epidemic, and laboratory facilities were not available. After the epidemic had subsided some of these *sadhus* were questioned as to where they came from. The replies received were of interest. Some came from the Punjab and the United Provinces and some from Sind.

Every year there is a festival held in Ajudiya near Agra in the United Provinces to celebrate the birth of Ram Chandra Ji. This year the festival was held on the 19th of April. Afterwards pilgrims scatter and visit the various places Ram Chandra Ji is supposed to have visited during his exile. Ilm in Swat is one of these places. On this account it is a place of pilgrimage for these Hindu *sadhus*. This year pilgrims came from the United Provinces and even from as far away as Calcutta. On looking through the reports of the Public Health Commissioner with the Government of India (Russell, 1937) it was found that no epidemic of cholera had occurred in the Punjab, except for a few isolated cases which must be obviously importations from other provinces where cholera is endemic. The United Provinces are shown to have had cholera continuously from April onward. Therefore the disease must have been an importation by a chronic carrier or carriers of non-agglutinating vibrios, perhaps from the United Provinces. The pilgrims stayed sufficiently long for the water-supply to have been widely contaminated. No outbreaks seem to have occurred anywhere else on the way up as perhaps their stay was not sufficiently long for wholesale pollution to have occurred and also because conditions were perhaps unfavourable to the persistence or multiplication of vibrios in the Punjab and Frontier provinces. In the Malakand Agency and in Swat thunder showers are common in the hot weather and this increases the percentage of salts and organic matter in the surface water, making it a favourable medium for the rapid multiplication of vibrios in an infected water. Such conditions occur in Bengal, where it is noticed that existing cholera epidemics are increased. Tomb similarly found this to occur in the Asansol mining area when bacteriological examination of surface waters was carried out. The epidemiology of the present epidemic seems to have depended upon the above facts.

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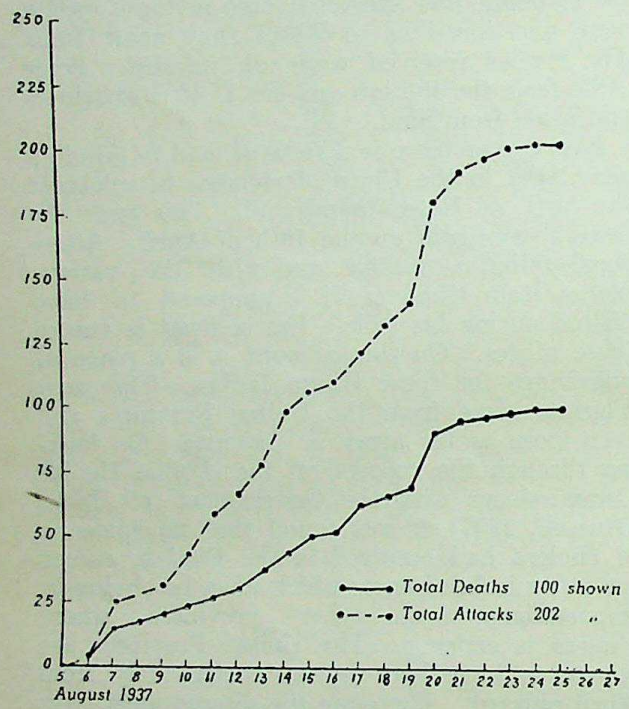
Preventive measures

The measures taken to combat the epidemic were as follows :—

1. The disinfection of the water-supplies. This at first proved difficult. The affected *nullah* to the north of the town was obviously the first line of attack. The Ruler was asked to close its entrance from the Swat river by means of a *bund* for ten days. But he refused to agree as the people of the town were dependent on it for the working of their grain mills and this would lead to a food shortage. Ultimately a compromise was made when it was closed for 24 hours and the whole bed of the *nullah* was limed for three-quarters of a mile



Graph showing daily total attacks and deaths.

from the village Nawe Kalai, well above the bathing site, to Mingora. The *bund* was then removed and the whole *nullah* flushed down. The effect of this was at once apparent. There were no further cases of cholera in Mingora five days after this was done. It was a very important factor in the control of the epidemic, as preventive inoculation with cholera vaccine could not have had time to be completely effective.

All wells were sterilized with potassium permanganate or bleaching powder so that by the end of three days every source of water-supply was sterilized. The stream to the south of the town was also disinfected and the people encouraged to draw their water from this source. It had its origin in a spring. It alone was sufficient to supply the whole town with drinking water, but we were at times opposed by the Pathans who thought they should take water from where they liked. After the first three or four days, co-operation was easier to secure in this matter as they had become frightened and were only too anxious to give every help.

2. The civil and military authorities in the Malakand Agency and in the Peshawar District were warned. Headmen, *tehsildars*, and the *jirgas* throughout the State and Agency were also warned as to what measures they were to adopt. In the State itself all villages contiguous to the affected area had written instructions issued in the vernacular, explaining the nature, mode of spread and control of the disease. These were read out to the people who were collected by beat of drum. Recruitment of coolies was stopped for work on the Malakand hydro-electric scheme and for road making in Waziristan while the epidemic was on.

3. Disinfection of houses and isolation of the affected area was carried out by making arrangements with the State authorities and the *tehsildar* of Mingora to have lime issued to the families in the affected houses. They were also instructed to burn all clothes and *charpoys* belonging to people who had died of the disease. This was in most cases done but it was difficult at times to ensure that the affected households would carry it out. Isolation of the houses and the affected area was carried out as follows :—

All houses where the disease had occurred were noted and the inhabitants of nearby houses warned that exchange of food or eating with families in the affected houses was dangerous. The isolation of the affected area was a difficult matter as it may be seen that the disease spread down the valley to other towns. Most of these cases were found to have been brought originally from Mingora and these small sporadic outbreaks did not show any evidence of it being water-borne. If it was one would have expected a more explosive outbreak in these latter places. The nearest it ever got to the Malakand Agency was a place called Abua, two miles from the State and Agency boundary. Here two cases occurred. These were definitely importations from Mingora as a woman had come from there to visit her sister in Abua and whilst there she developed and died of the disease. Subsequently the sister also developed the disease. There were no more cases after this. The people of this village were by then alive to the danger of house-to-house contact.

When the spread downward occurred anxiety was felt as to whether the Malakand Agency would be affected. A posse of Lavy Sepoys with a sub-assistant surgeon was then stationed at Landaki post, the boundary between Swat State and the Malakand Agency.

Here this sanitary cordon functioned throughout the epidemic and all motor traffic and travellers were stopped and examined. The lorry drivers gave good co-operation, reporting at once any cases of illness which had occurred on the downward journey. A dispensary nearby at Thana was cleared and opened to receive any suspicious cases. One or two people were detained with vomiting, diarrhœa, etc. They

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were subsequently proved to be malaria and dysentery. All fruit and vegetables were also prevented from being brought into the Agency at this point. The position of this sanitary cordon was luckily at a good place. If the sketch map is consulted it may be seen that the river is on one side and a range of hills on the other. Thus it guarded the entrance to the Agency and the first big town in the Agency is Thana. Of course it was difficult to guard against a stray carrier who might have wandered across the hills to Thana, but this was thought to be unlikely as all traffic moves through the Landaki post, as the only direct road from Mingora through Swat State passes through here.

4. An inoculation centre and a cholera camp was opened in Mingora. In all 29,590 inoculations were performed throughout the epidemic. The demand for inoculation was surprising on the first day. The centre in Mingora was rushed by the population and the crowd had to be regulated by the State troops. The inoculations proceeded throughout the epidemic and it was subsequently also carried out in the other villages down the valley. A cholera camp, one part for females and the other for the reception of male cases, was opened. This was near the inoculation centre situated to the north of the town, where most of the cases were occurring. It was thought best to localize it here as it was the best situation and away from the south part of the town where the water-supply had been sterilized.

Essential oil mixture was distributed freely to early cases and to all contacts. Collapsed cases were removed to the cholera camp and there given Rogers' alkaline and hypertonic saline solution intravenously. Difficulty was experienced with females who were keeping purdah. They were collected into one large compound of an empty house and there received treatment and inoculation as required.

Final course of the epidemic

Later during the epidemic the disease spread down the valley, as mentioned before, principally to the Barikot *tehsil* half-way between Mingora and Thana. These cases were at once investigated and were proved to have been contact cases from Mingora. Every subsequent case was investigated at once all over the State, as by this time every disease was being called cholera by the frightened population. An assistant surgeon was deputed to this duty. The epidemic continued in a sporadic manner after the disease had ceased in Mingora and eventually it died out. Inoculations and preventive methods were here also carried out vigorously. As mentioned before, the furthest down the disease spread was to within two miles of the Agency boundary.

(*Continued at foot of next column*)

PRAWNS AS A POSSIBLE VECTOR OF *V. CHOLERÆ*

By K. P. KUNDU, M.B. (Cal.), D.Bact. (Lond.)
Director, Harcourt Butler Institute of Public Health, Rangoon

and

U. PA HOW
Assistant Bacteriologist

IN the year 1936, an experiment was carried out at the Harcourt Butler Institute of Public Health, Rangoon, in connection with the viability of *B. schafferi* in natural water collections (*vide* Annual Report of the Institute for the year 1936, pages 12 and 13). During the course of these experiments, a fresh-water prawn came under observation and a vibrio, which gave the

(*Continued from previous column*)

From the 26th August no further cases occurred and the area was declared free from cholera at midnight of 2nd September, 1937.

Summary and conclusions

This epidemic presents several interesting points in that this province was free from cholera this year until the present outbreak. The *sadhus* who made a pilgrimage to Swat State in June and July appear to have been responsible. The latter is a very important matter from the public health point of view, as under present-day conditions the disease can be disseminated rapidly in a widespread manner on account of the rapidity of road and rail transport. The people who go on pilgrimage generally visit towns and villages, where they are given food and shelter by their co-religionists, to their detriment as happened in this epidemic. In this province the *Powindah* families, who are nomadic, generally introduce the disease while they are on their way back to Afghanistan. On this occasion this was not so. That the vagrant pilgrim population who may visit this province are of considerable danger is shown and that their presence may make itself felt long after they have left is well exemplified in this epidemic. Finally, the disease appears to have been carried a long distance before it became apparent and culminated in an explosive outbreak.

In conclusion I should like to thank Lieut.-Colonel W. E. R. Dimond, I.M.S., Assistant Director of Health, N. W. F. P., for his help during the epidemic and to Colonel R. S. Townsend, M.C., I.M.S., Inspector-General, Civil Hospitals, N. W. F. P., for permission to publish this article.

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following reactions, was isolated on 23rd May, 1936, from this prawn :—

Motility	Lactose	Glucose	Saccharose	Maltose	Mannite	Salicin	Dulcite	Adonite	Cholera red	Indol	Citrate	V.P.	M.R.	Litmus milk
++	–	A	–	A	A	–	–	–	–	+	–	–	+	Acid

It was decided to start an investigation into the presence of vibrios in prawns, lobsters and shrimps; experiments were accordingly started in 1937 and are still being continued.

In the course of these experiments a large number of vibrios have been isolated, all of which except two have failed to agglutinate with high-titre anti-cholera serum. It is proposed to publish details concerning these in a subsequent paper. The present article is intended to draw attention to the fact that on two separate occasions, typical cholera vibrios were isolated from prawns. These prawns were taken from consignments that were brought from the Delta districts of Burma to Rangoon, for sale in the public market.

The prawns are caught in the various creeks that abound in the Delta, and are brought in baskets, in launches to Rangoon. They are acquired in this laboratory by sending an attendant to the wharf, where they are landed. The attendant, prior to purchase, ascertains from the vendors the particular district in the Delta from which the prawns come.

In this way, on 23rd February, 1938, a prawn (prawn 'A') caught near Bogale in Pyapon District was examined and a typical cholera vibrio of Heiberg's type II was isolated. This vibrio on isolation agglutinated with 'H' and 'O' and also Inaba 'O' sera. The agglutination was done both on slide and in rack.

On a second occasion on 29th March, 1938, investigation of prawns from the same district showed in one (prawn 'B') the presence of a vibrio which on isolation agglutinated rapidly (slide agglutination) with 'H' and 'O' sera. In this case 'O' agglutination, however, was not observed until five minutes after the slide was prepared. Rack agglutination with Inaba 'O' serum examined after 18 hours showed an agglutination in a dilution of 1 in 125.

The last reported case of cholera from Pyapon District was recorded on 29th May, 1937. The first case recorded this year was notified on the 27th February, 1938. The history being as follows :—

Patient came from Kyonta village (which is very close to Bogale) to Dedaye, on the 27th February, 1938, in the day-time. In the evening he took 'Gyinthok and Laphet' (pickled ginger and pickled tea). He began having loose motions about midnight and also vomited once. Suppression of urine and cramps in his calves. Rice water stool. He died in the hospital late at night on the 28th February, 1938.

(*Continued at foot of next column*)

ANTI-MOSQUITO MEASURES IN CANTONMENTS WITH SPECIAL REFERENCE TO 'DRY DAY' INSTITUTED IN 1927

By F. F. STROTHER-SMITH
COLONEL, I.M.S.
Offg. A. D. M. S., Rawalpindi District, Murree

The term 'dry day' is a misnomer because it is only necessary that a period of three hours from 6 a.m. to 9 a.m. on one day a week should be dry. During this period of three hours all receptacles for water in cantonments must be

(*Continued from previous column*)

Cultural reactions of vibrio prawn 'A'

Motility	Lactose	Glucose	Saccharose	Maltose	Mannite	Salicin	Dulcite	Adonite	Cholera red	Indol	Citrate	V.P.	M.R.	Litmus milk
++	–	A	A	A	A	–	–	–	+	+	–	–	+	Acid

Mannose	Saccharose	Arabinose	
–	A	–	Heiberg type II

Cultural reactions of vibrio prawn 'B'

Motility	Lactose	Glucose	Saccharose	Maltose	Mannite	Salicin	Dulcite	Adonite	Cholera red	Indol	Citrate	V.P.	M.R.	Litmus milk
++	–	A	A	A	A	–	–	–	+	+	–	–	+	Acid

Mannose	Saccharose	Arabinose	
–	A	–	Heiberg type II

Summary

(1) Examination of prawns from the Delta districts on two occasions revealed the presence of typical cholera vibrios, the agglutination and cultural reactions of which would have led to the diagnosis of cholera had they been isolated from the excreta of a suspected case of cholera. The isolation of one of these vibrios occurred just before the report of a case of cholera in Pyapon District which had previously been free from cholera for nearly nine months.

(2) As prawns are a favourite article of diet in Burma, the above finding would appear to call for further extensive investigation.

(3) Investigations are also needed to see if typical cholera vibrios can be regularly found in prawns prior to the outbreaks of cholera which occurs annually in the Delta districts.

(4) A further communication will be submitted in connection with those vibrios which were isolated from prawns got from the Delta areas and were found to be non-agglutinating with high-titre anti-cholera serum.

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empty. These include water troughs for animals, garden tanks and *nullahs* in gardens, all small pits and bullock runs from wells, etc. Fire buckets are allowed to be emptied and immediately refilled or if this is not possible, for example in grass farms, a small amount of cresol solution is added to each bucket to prevent breeding of mosquitoes. If all units and bungalow owners in cantonments co-operate and see that every possible breeding place in their unit lines or bungalows are 'dry' during this period, mosquitoes will be unable to mature. From the time the female mosquito lays her eggs in the water until the mature mosquito flies away is more than eight full days. This explains the object of the 'dry day' scheme.

In some cantonments there are large areas of water which cannot be emptied. It will generally be found that very little breeding takes place in these areas unless they are in the shade. The edges of these areas must be kept clean of grass and all forms of undergrowth. Hoof marks around the sides are carefully watched and sprayed with oil if necessary. In Meerut where we have a number of these large borrow-pits under the direct rays of the sun I have never been able to discover mosquito larvæ, except in hoof marks and in drains leading into the pit. These drains should be filled in. Areas where water has been noticed to lie during the monsoon should be marked with pegs and gradually filled up as soon as possible. A garrison engineer who is willing to be helpful can supply a lot of material from old buildings during demolition and the contractor will dump it in a *place for the unit to spread.*

The scheme is organized as follows :—

An anti-malarial medical officer is appointed in each cantonment to work under the orders of the senior medical officer. In large cantonments such as at Meerut, Rawalpindi, Lucknow, this should be a whole-time job from 1st February to 1st November.

On 1st February each year—that is in Northern India—each unit will appoint an officer as unit anti-malarial officer, and a squad of one N. C. O. and two to four men according to the size of the unit. All these officers and other ranks, whether British or Indian, will be given a course of lectures on the scheme and on anti-malarial work. They will be taken round their own lines by a medical officer and all danger areas shown to them and anti-malarial methods described in relation to their own lines. The first 'dry day' should be in the first week of February—this may appear a little early but I have found that it is necessary to have at least two 'dry days' before all units and bungalow owners get into the working of the scheme.

Outside unit areas

A squad of one British N. C. O. and from two to five other ranks, according to the size of station, is appointed at the same time as unit squads.

It is the duty of this squad to carry out anti-malarial work on the British troops' side of the station. A similar squad of Indians is appointed for the Indian troops' side of the station.

Taking Meerut as an example—we have one British N. C. O. and five other ranks for the British troops' side and the same number of Indians for the Indian troops' side. Taking the British side—the whole area outside unit lines is divided up into five parts and allotted to the five men. Each man's area is again subdivided into five areas—one area for each day of the week except Thursdays. Reports on these areas are taken daily at 10-30 a.m. by the anti-malarial officer and the cantonment map flagged to show breeding areas. On Thursdays —that is 'dry day'— each man inspects his whole area to see that 'dry day' is being observed, and in case of non-observance a report is furnished to the anti-malarial officer who prepares two lists of defaulters, one of military personnel for the Station Commander and one of private individuals, shop owners, etc., for the executive officer. In the case of the latter prosecutions are ordered after the third offence—they having previously been warned on each occasion.

Each member of this inspecting squad carries a book of duplicate cards and in case of non-observance he gives a card to the owner or a servant and shows him where the fault lies, *i.e.*, a tank full of water or *ghurra* full of water and breeding mosquitoes. He obtains the signature of the owner or the servant on his duplicate card. This is important later, in case a prosecution is ordered. The same scheme applies to the Indian troops' side of the station.

It will be seen at once that the success of the scheme largely depends on the support given to the medical authorities by the Station Commander. Personally I have never had any difficulty in this respect.

A brigade or station order should be published in the beginning of February. The following is a copy of that published in Meerut :—

Anti-malarial measures, 1936

With effect from 13th February, 1936, anti-malarial inspection will take place every Thursday from 6 a.m. to 9 a.m.

2. Every Thursday, all water tanks, channels and every depression where water is lying will be cleaned out and left dry from 6 a.m. to 9 a.m. during which hours they will be inspected by anti-malarial squads. Any tanks, channels, etc., not required should be filled in with earth. This applies to officers' bungalows as well as unit lines.

3. Officers Commanding Units will make a thorough inspection of their barracks and lines, paying particular attention to places where detached men live and spend much of their time, *e.g.*, married quarters, stores, etc., and to places such as horse jumps, obstacle courses, and field works, where water is likely to lie.

4. Bungalow residents should make a thorough inspection of their houses, outhouses, stables and compounds. They are requested to flit their wells early every morning to destroy mosquitoes and their larvæ. The cost of doing so is small.

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The following is a copy of the circular letter sent to units in Meerut in 1934 and might serve a useful purpose if published in orders in every cantonment in India :—

Subject:—*Anti-malarial measures*, 1934-35.

The attention of all concerned is drawn to Brigade Order No..... dated.....

I am directed by the Brigade Commander to say that all cases of non-observance of 'dry day' reported by the S. M. O. to this Headquarters will be investigated by this office and that after the 10th March, 1934, all officers not observing 'dry day' will be seen by the Brigade Commander and required to explain personally the reasons why Brigade Orders have not been carried out'.

In each cantonment the cantonment board usually gives a grant for anti-malarial work. I think a better plan is to ask for coolies—the number according to the size of the cantonment. In Meerut we have 10 to 12 men during the malarial season. This batch of coolies works under the orders of the anti-malarial officer and is available for work in both British and Indian areas. They fill in pits, carry the oil under the direction of the N. C. O., keep down overgrowth of weeds and grass and clean the edges of all large areas of water.

The use of oil for water lying in small isolated depressions in lines and riding schools is to be deprecated. These pits and depressions should be filled in by the unit concerned.

Besides the above scheme for prevention of breeding of mosquitoes, other means of preventing malaria are :—

(1) We have in each unit lines a child-welfare centre—in reality a dispensary for the families—with a nurse in charge. It is the duty of the nurse under the direction of the lady sub-assistant surgeon to examine all children for enlarged spleen at the beginning of each hot weather and a list of those discovered is kept in the centre. These children are given quinine and treated in the usual manner.

(2) Mosquito nets are used except in the very hot dry period from 15th May to 25th June roughly. During this period there are no mosquitoes and all troops are very grateful for this respite during the very hot period. In Meerut since 1932 this has been done with the exception of this year when the rains started at the end of May. No increase in the number of malaria cases can possibly result from this.

It may be mentioned here that the above scheme was so successful in Sialkot in 1927, 1928, 1929 and 1930, that nets were not necessary at any period throughout the year and the number of malaria cases fell from several hundreds to almost *nil*. This success was in a large measure due to the fact that we had a regiment of Sikh Pioneers under a commanding officer who was himself an anti-malarial expert. This regiment carried out most of the anti-malarial drainage, etc., in Sialkot.

The application of the above scheme will naturally be more difficult in cities and towns

(*Continued at foot of next column*)

CINCHONA FEBRIFUGE IN THE TREATMENT OF MALARIA

By RAMKRISHNA N. GORE, L.M. & S.

For twenty years (1905 to 1925) I used quinine for the treatment of malaria, either by mouth or hypodermically, in doses smaller than

(*Continued from previous column*)

outside cantonments. The collector and municipal and district boards have not got the same powers to see that these orders and recommendations are carried out, as the Station Commander has in cantonments.

Still if this scheme, in so far as it can be carried out in civil areas, is explained to the public by posters and leaflets in the language of the people and by a notice in the local cinema the day before the selected dry day, I feel that the attention of the people will be drawn to the value of the scheme.

The local health officer, with the assistance of a number of trained *jemadars*, should go round the cities and towns and advise the people, and on dry day make a thorough inspection of the areas allotted to them, and where necessary deal with breeding areas or empty troughs, *ghurras*, tins, etc., where mosquitoes are breeding. All private practitioners can help by giving their patients instructions about the scheme and telling them how it works, and very soon the simplicity and the value of the scheme will be instilled into the minds of the people.

I am at present carrying out tests in Rawalpindi with a new spraying machine for barracks and houses called the 'phantomyst'. The solution used in this machine—Lethane in 3 per cent solution in kerosene oil—is most effective against mosquitoes, flies, etc.

This machine produces a fine mist in the room and penetrates to all parts of the room. Other solutions such as 'pyefly' and pyrethrum can be used but I have found 'lethane' most lethal. This machine is most economical—a large model D.1 will only use one ounce in 5 minutes. If this is taken into consideration in comparison with the use of the usual hand and foot pumps—in both the latter the spray is in the form of droplets and large quantities are used—great economy will be effected.

In the malarial season cinema houses harbour large numbers of mosquitoes and spread malaria. A machine such as the above used for half an hour or less before the performance will kill off all mosquitoes and other insects and also purify the air.

This machine can be purchased in various sizes from Messrs. Andre (Components), Ltd., 38, Felsham Road, Putney, S.W.15, London, to whom I am indebted for the use of a D.1 'phantomyst' to test in Rawalpindi.

The 'lethane' can be obtained from Messrs. Charles Lennig & Co., Ltd., 177, West Street, Erith, Kent, England.

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are ordinarily recommended. I found the treatment effective in relieving patients of fever, but not in preventing relapses or enlargement of the spleen. In respect of these two manifestations of malaria; I wished for a better drug, and the change from quinine to cinchona febrifuge I was led to adopt after reading the convincing contribution 'On a Standard Treatment for Malaria' by Acton and Knowles (1924). In spite of this article this treatment has enjoyed little popularity in this country. It is now being realized that quinine has not been able to fulfil the expectation of an ideal cure for malaria.

Believing that few patients would like the cinchona mixture, it occurred to me to try the febrifuge and test its efficacy in the form of tablets. The first case on which I tried the febrifuge was one of my servants who every year suffered from malarial fever with severe rigors and bilious vomiting. His spleen was enlarged and by 1925 it had reached the umbilicus. Until then he was being treated with quinine hypodermically. It used to relieve him of the fever but had no influence on his spleen.

After the last injection 4-grain tablets of cinchona febrifuge (Java) were given, three tablets a day, morning, noon and night, to be swallowed with water, for seven days, then twice a day for a fortnight and once a day for a week more.

The servant himself having noticed a definite reduction in his spleen, asked me to confirm it. On examination I was greatly struck with the marked reduction in the size of his spleen. The response to cinchona was spectacular, the spleen was now less than half, there being improvement in his general health, and the pallor in his face was replaced by some redness.

This case so greatly impressed me that I commenced the use of cinchona febrifuge tablets in my practice in place of quinine, and I found it to be a success not only in ridding the patients of fever but in preventing relapses and definitely reducing enlarged spleens. One effect, which does not appear to have been alluded to in the literature, is the laxative effect of the febrifuge. In fact this effect was brought to my notice first by my servant and then by the patients, by their enquiring if I had added anything to the tablets to move the bowels.

Fever and hypertrophy of the spleen, the most prominent symptoms of malaria, develop with the disease and disappear as it is cured. The therapeutic value of cinchona febrifuge in malaria has long been accepted. From 1925 to 1932 when I had to retire from practice on account of ill health, I used cinchona febrifuge almost with uniform success for nearly seven years in place of quinine.

Among rural populations suffering from malaria, my experience suggests that cinchona febrifuge powder should be the drug of choice. Honey is a good vehicle for making pills or

(*Continued at foot of next column*)

PRELIMINARY REPORT ON AN EXPERIMENT IN COOLIE-LINE SANITATION

By K. P. HARE, M.B., B.S. (Lond.), L.M.S.S.A.
Medical Officer, Tingri Medical Association, Assam

The problem presented

FROM a public health point of view the three major scourges of the Assam Valley tea estates are malaria, dysentery and hookworm disease. The two latter are, essentially, diseases of faulty sanitation since, in both, infection is spread by badly disposed fæces. The management have done a great deal towards improvement of coolie-line sanitation by their enthusiastic adoption of the tube-well system of water supply which avoids the danger of contaminated surface water. This measure has, undoubtedly, reduced the incidence of dysentery and other bowel diseases but has, of course, had no effect on hookworm infection and has left untouched the problem of fly-spread of bowel infections. The coolies, at present, defæcate on the ground in any convenient situation round about their lines, very frequently among the tea bushes themselves. Conditions are, therefore, ideal for contamination of food by flies and for infection and re-infection by hookworm of the coolies working among the tea bushes. Moreover, the intolerable smell pervading certain areas can be easily imagined. The provision of some type of latrine is the only solution to the problem,

(*Continued from previous column*)

paste and since honey is available in villages, 4-grain pills can be made with it for adults, and for children a proportionate quantity can be made into a paste with honey. This method of administering cinchona febrifuge has been found very suitable.

As cinchona febrifuge is efficacious and cheap it will ensure the greatest benefit to the greatest number for the money available. According to Acton : 'A most important point in the treatment of malaria is that it shall be continuous'. It must also be realized that the method of administration and the doses which have varied within wide limits count in the successful treatment of the malaria sick.

Since 1916 I began giving as a routine a 3-grain dose of quinine hydrochloride just at the commencement of the rigor or of fever if without a rigor, with the idea that fresh parasites in the plasma before entering erythrocytes would be killed in greater numbers, as quinine is absorbed very rapidly and a small quantity of it is inimical to the freshly liberated parasites. This single preliminary additional dose of quinine gave better results than cinchona febrifuge without it.

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Acton, H. W., and Knowles, R. (1924). *Indian Med. Gaz.*, Vol. LIX, p. 177.

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but many types have been installed in this district in the past and they have been universally unpopular with the coolies. They have been installed in the compounds of tea estate factories and hospitals and the coolies have objected to their communal aspect and refused to use them except under compulsion. The management have, therefore, not been encouraged to experiment with communal latrines in the lines. The question whether some form of latrine, which the coolies would be willing to use, could be provided at an economic cost was, therefore, taken up with the Superintendent of the Tingri Tea Co., Ltd. The Balimara line of Dirial Tea Estate was selected for the experiment, as it is a fairly isolated line of a reasonable size (the total population is 130 souls) and compactly planned. I was unfortunately prevented from making a stool survey of this line, before a mass treatment of oil of chenopodium (m. xxx) was given, by a tornado which swept the district and made heavy inroads on my time. The results of other surveys are given in tables I, II and III :—

Table I

Stool survey of a random sample of 255 coolies, resident in this district, of all ages and in good health

Infection	Number infected	Percentage incidence
All helminths	208	81.5
Hookworm	165	64.7
Ascaris	113	44.3

Table II

Stool survey of 112 persons, being the total population of an isolated line on another estate

Infection	Number infected	Percentage incidence
All helminths	103	91.9
Hookworm	97	86.6
Ascaris	54	48.2
Trichuris	61	54.4

Table III

Stool survey of 56 persons, being a random sample of coolies living on Dirial Tea Estate, excluding the Balimara line

Infection	Number infected	Percentage incidence
All helminths	49	87.5
Hookworm	40	71.4
Ascaris	33	58.9
Trichuris	29	51.8

In all these surveys a saline concentration method was used to eliminate errors in diagnosis as far as possible*.

The percentage incidence rates for dysentery in the Balimara line and in the other lines of Dirial Tea Estate are given in table IV :—

Table IV

Dysentery on Dirial Tea Estate

Line	Period of observation	Number of cases	Percentage incidence
Balimara ..	June 1936 to May 1937.	9	6.9
Other lines ..	Do.	38	3.7
Balimara ..	June 1937 to February 1938.	3	2.3
Other lines ..	Do.	27	2.6

Note.—Tube wells were sunk in 'other lines' in May 1936 but not in Balimara line until May 1937. The effect was to reduce the dysentery incidence of that line to that of the remainder of the estate. The latrine system was installed in Balimara line during February 1938.

Type of latrine provided

Enquiry among the coolies living in the Balimara line elicited the information that they would willingly use latrines if a separate one could be provided for each family and that, under such circumstances, they would themselves be responsible for the cleanliness of the latrines. Doubts as to smell and danger of contamination of the tube well were raised but were easily disposed of. The only type of latrine providing effective sanitation consistent with economy, considering the number needed, is the 'bored-hole'. The next problem was the design of a suitable housing which must be cheap, clean, easily erected and reasonably durable. Tales of difficulty regarding doors had also come to our ears. Sun-dried bricks, made on the estate with a Kapax machine, came to the rescue and made possible the design of a cheap and effective shelter. Doors were dispensed with and wing walls substituted and roofs were omitted for several reasons. Firstly, many coolies object to a roofed latrine on the grounds that 'it is wrong to defæcate in a house', secondly, the open construction allows of natural cleansing of the squatting plate by rain and, thirdly, cost was enormously reduced. The houses in this particular line are double, that is to say, each

* Approximately 0.5 c.cm. of stool was shaken up vigorously with 10 c.cm. of saturated common salt solution and the mixture transferred to a tube $\frac{5}{8}$-inch in diameter holding 10 c.cm. A $\frac{3}{4}$-inch cover slip was placed on the top, in contact with the upper surface of the mixture, and allowed to remain so for thirty minutes. It was then removed and examined under a $\frac{2}{3}$-inch objective.

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house has a central partition making it suitable for two families so that the latrines also were built in pairs. Scale drawings are appended (figures 1 and 2). A general plan of the lines is given in figure 3.

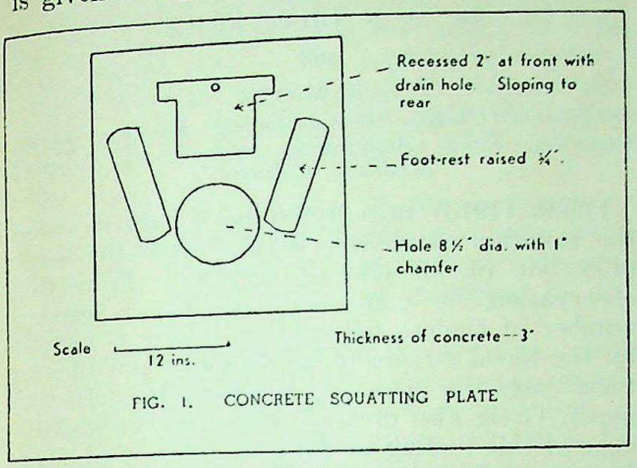

FIG. 1. CONCRETE SQUATTING PLATE

The general construction is as follows :—

The bored-holes are made in the usual way with a fourteen-inch augur and vary in depth from fourteen to twenty feet according to the

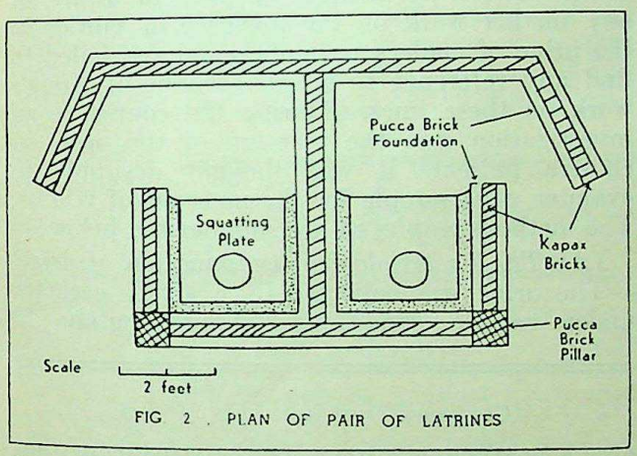

FIG 2. PLAN OF PAIR OF LATRINES

level of the water table. They are covered by the squatting plates (set on cement) around which the shelter is built. Low foundation walls, one foot high, and two corner pillars are

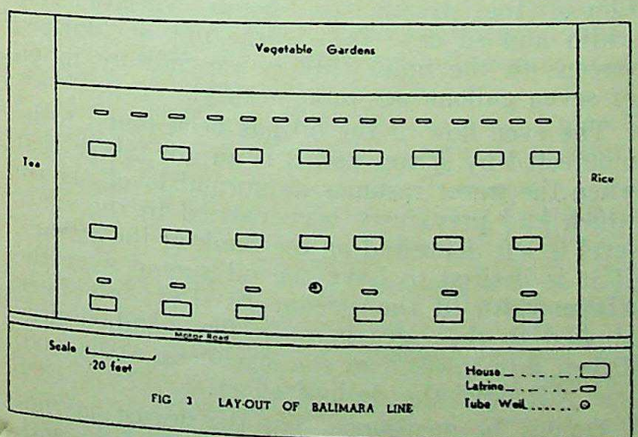

FIG 3 LAY-OUT OF BALIMARA LINE

of *pucca* bricks. The main body of the walls is of Kapax bricks topped by two courses of *pucca* bricks to withstand direct heavy rain. The full height of the walls from the ground is five feet six inches. The space between the squatting plate and the walls is filled in with concrete sloped up to the walls. The whole structure is made weather-proof by painting the Kapax bricks with two liberal coats of a mixture of tar and crude oil.

The estate manager has very kindly supplied me with the following specification and bill of costs for making one pair of latrines :—

Quantity	Material	Price Rs.	As.	P.
200	.. *Pucca* bricks ..	5	0	0
500	.. Kapax „ ..	1	0	0
10 seers	.. Lime ..	0	4	0
2 bags	.. Sand ..	0	4	0
5 seers	.. Cement ..	0	7	0
15 „	.. Tar ..	3	12	0
2 gallons	Crude oil ..	0	11	0
2	Squatting plates	3	8	0
	Labour for boring	2	0	0
	„ „ building	7	0	0
	„ „ painting	0	4	0
	TOTAL Rs. ..	24	2	0

He informs me that these costs are greater than they should be and that by employing labour directly instead of through a contractor they could be reduced by about Rs. 4, giving an all-in cost of about Rs. 10 per latrine (or family).

Practical experience.—From the very first these latrines have been completely popular. There has never been any hesitation on the part of any of the coolies in using them and they do, in fact, take a pride in keeping them clean. Within a very short time of their completion coolies from the other lines on the estate were asking to be similarly equipped. The management hope to equip one other line, at least, during the ensuing winter. The oil and tar coating appears to be effective in protecting the Kapax bricks from the effects of heavy rain and the bored-holes show no tendency so far to subside although no bamboo lining has been used. Æsthetically, there is some satisfaction in being able to walk anywhere round about this line without one's nostrils being assailed at every step. Regarding the effect on incidence of dysentery and hookworm infection, I hope to present a further communication at a later date.

Summary.—An account of the difficulties involved in securing adequate sanitation in Assam tea estates is given and a successful solution is described.

Acknowledgments.—My thanks are due to Mr. F. Woolley Smith, Superintendent, Tingri Tea Co., Ltd., for his permission to carry out this experiment, his interest in its progress and for permission to publish this account. I am also indebted to Mr. J. R. Morris, Manager, Dirial Tea Estate, for carrying the idea into effect, for his part in the design of the housings and for the specification accompanying this account.

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AN APPARATUS FOR CONTINUOUS OILING OF STREAMS

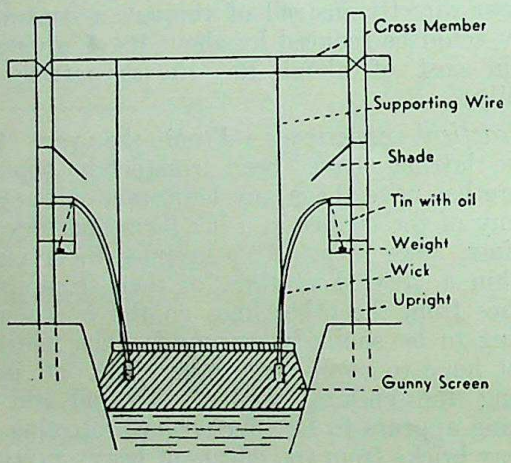
By E. G. MICHELSON, M.B., Ch.B. (Aberdeen)
Kalighat, South Sylhet, Assam

The use of oil screens on small slow-running streams as a means of controlling mosquito breeding on tea estates is practically universal, and its advantages are well known. It has also certain disadvantages and defects, and it is to remedy these that the following modification is suggested.

The greatest enemy of the oil screen is the sudden storm which comes along and sweeps away all the oil leaving that stretch of stream full of the larvæ from the stretch further up, and unless immediate oiling is carried out a large number of these hatch out in a few days and up goes the malarial rate. To do away with this defect in some measure the little addition described here has been tried out and found to work well.

The materials required for each screen are simple—two tins and two pieces of wick.

The tin should be of quart size or a little bigger, and it is fixed top and bottom by means



of wire, just above high-water level to the supporting upright of the screen—one tin to each upright.

The wick used and found most efficient is two and a half inches wide and double thickness. To one end is attached a weight, or else some measure adopted whereby the wick cannot be blown out of the tin. This end is placed in the tin which has been filled with oil, and the other end of the wick is stitched to the canvas or gunny of the screen. The gunny of the screen should be wide enough to allow for rising water, and the stitching of the wick should be just on the level of the usual width of the stream.

A piece of wire twisted round the tin and allowed to project out for about six inches will prevent the wick resting against the tin and so wasting oil. Over each tin a small shade may be constructed to prevent undue evaporation.

Experience has shown that with this size of wick one quart of oil will last for eight days and give a continuous coating to the stream for that time. It has also been found that the ideal distance apart for screens to give the maximum effect to the oil is about 130 yards, but that distance will naturally vary with the configuration of the stream, *i.e.*, bends, variations in width and so on. This works out at fourteen screens to the mile with an expenditure in oil of seven gallons per mile weekly.

(*Continued at foot of next column*)

(*Continued from previous column*)

The even flow of the oil has been found to be unaffected by spates and it is an advantage that when the water resumes its normal level, the oil which had previously been carried to the spate level is left deposited on the bank of the stream. If it is desired to have the oil spread over the whole width of the stream (it has only been applied to the sides here) a few bamboo pegs driven into the bed of the stream in a diagonal line will have the desired effect.

It may be mentioned that the device has not been tried out with Malariol but only with crude oil. The evaporation of the former would render the rate of consumption somewhat higher.

THE BACTERIOLOGICAL EXAMINATION AND THE HYDROGEN-ION CONCENTRATION OF THE URINE OF A SERIES OF 122 CHOLERA PATIENTS

By D. N. CHATTERJEE
and
K. S. MALIK
(*From the Cholera Bacteriological Enquiry, Indian Research Fund Association, School of Tropical Medicine, Calcutta*)

Greig (1913) in a preliminary note recorded the isolation of cholera vibrios from the urine of 8 out of 55 cholera patients. From this observation he concluded that in a certain number of cholera patients the vibrio is carried by the blood stream to the kidneys and that in these cases the disease is a septicæmia. In this paper, Greig also drew attention to the importance of this finding in the prevention of cholera. In two of Greig's cases vibrios were recovered from the urine during the stage of convalescence when the patients were working. Although these observations have been accepted by all subsequent writers on cholera we are not aware of any further work on the presence of vibrios in the urine of cholera patients and have failed to find any reference to a full account of Greig's work on these lines. During the course of an investigation into the reaction of the urine of cholera patients it was thought desirable to examine each sample for the presence of vibrios. The methods employed are summarized below:—

(*A*) *The bacteriological examination of urine.*—The urine was collected by a sterile catheter under aseptic conditions. Approximately 10

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c.cm. of the urine was added to a tube containing 2 c.cm. of 10 per cent peptone water and the reaction, if acid, made alkaline by the addition of 4 per cent caustic soda; bromothymol blue was used as an indicator. In a certain number of patients the quantity of urine obtained was less than 10 c.cm. when it was added to 1 per cent peptone water. The peptone water tubes after incubation were plated on bile-salt-agar plates. A few drops of urine from the bottom of the tube were plated direct on a bile-salt-agar plate.

(*B*) *The determination of the hydrogen-ion concentration.*—The pH of the urine was determined by the colorimetric method (Hellige's comparator) soon after the collection of the sample.

Results.—Catheter specimens of urine from 122 patients suffering clinically from cholera were examined. The urines were collected on various days of the disease, from the 1st to 7th day. Vibrios were not isolated from any of the samples of the urines examined.

The hydrogen-ion concentration of the urine from 50 bacteriologically-proven cases of cholera was determined. The urines of 27 apparently normal individuals of the same class as the cholera patients were examined as a control series. It was found that the reaction of the urine during the acute stage of the disease was markedly acid and became normal on about the seventh day.

The average hydrogen-ion concentration of the urines collected on different days of the disease is shown below :—

Day of disease	1	2	3	4	5	6	7	Urine of 27 healthy individuals
Average pH of urine.	4.9	5.0	5.4	5.5	5.6	5.6	5.9	6.0

Summary.—(1) Samples of urine collected by catheter from a series of 122 cholera patients were examined for the presence of *V. cholerœ*. Vibrios were not isolated from any of the samples.

(2) The hydrogen-ion concentration of samples of urine of a series of 50 bacteriologically-proven cholera patients was estimated. It was found that the urine during the acute stage of the disease was markedly acid (pH 4.4 to 5.4) and became normal as the acute symptoms subsided.

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Greig, E. D. W. (1913). *Indian Journ. Med. Res.*, Vol. I, p. 90.

A Mirror of Hospital Practice

ECTOPIC KIDNEY SIMULATING OVARIAN TUMOUR

(WITH REPORT OF A CASE)

By P. C. ROY, M.B., L.M. (Dublin)

Lecturer in Obstetrics and Gynæcology, Orissa Medical School, Cuttack

ECTOPIC kidney in the sacral region is a rare condition. It is not only an interesting condition but its recognition may prove of importance and present difficulties in the differential diagnosis of tumours of the genital organs and adnexa in women.

A case recently occurred in the Cuttack General Hospital of which an account is given.

Mrs. X, married, aged 24, was admitted to the Cuttack General Hospital in January 1938, complaining of colicky pains of the lower part of the abdomen, particularly in the flanks and on the right side, sometimes transmitted to the thigh and into the right subcostal region. She also noticed a lump (duration two years) situated just above the right side of the pubis, which, she stated, was constantly changing with movement, intra-abdominal pressure and the periodical filling and emptying of the bladder and rectum.

Menstruation began at the age of 15 years and recurred every three weeks for three days; there was scanty flow with pains at the beginning. Urination was difficult and sometimes painful. She was habitually constipated. She had been married when 20 years of age. Her present complaint had lasted for two years during which time she had several attacks of generalized colicky pain in the abdomen and right loin, aggravated during defæcation and urination. She never suffered from fainting during the attack. She was well nourished and her heart and lungs were normal.

Urine—normal.

Stool—negative except for scanty hookworm infection.

Blood—nothing abnormal.

The temperature and pulse rate were normal. The abdomen was soft with slight tenderness over the tumour in the suprapubic area. A lump could be felt above the pubis, it was about the size of a man's fist and could be displaced outside and to the right from the pelvic region.

On bimanual examination the cervix of the uterus was felt to be directed slightly backwards. The body of the uterus was anteverted and anteflexed, of normal consistence and mobile. Behind the uterus there was felt a tumour about the size of a man's fist, solid in consistence and fairly mobile, oval in shape with smooth surface, not tender even on deep pressure. The right ovary could not be palpated. On the left side both the left ovary and fallopian tube were palpated and found to be normal. The case was thought to be a solid right ovarian tumour with a lengthy pedicle, which became twisted at times, producing the characteristic symptoms of occasional pain of colicky nature. On the 21st January, an operation was performed, under general anæsthesia. The abdomen was opened in the middle line (sub-umbilical incision). The uterus, fallopian tubes and both ovaries were found to be normal. But behind the uterus and on the right side there was a kidney-shaped tumour with a long mesentery, attached to the right side of the sacrum. An incision into the capsule of the tumour revealed

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kidney substance. It had its hilum pointing towards the pubis. From this the ureter could be traced and on the poles of the kidney there were multiple long arteries from the middle sacral and iliac arteries. The left kidney was found to be normal and in its normal position.

Nephrectomy would be the usual procedure but owing to the fact that the kidney was found to be normal in appearance and had a long mesentery, which could be lifted up to the right lumbar region, nephrectomy was not done. The kidney and its mesentery was lifted up to the lumbar region, its capsule being opened and fixed to the right posterior abdominal wall by some mattress sutures. The abdomen was closed in the usual manner. The patient made an uneventful recovery. She has had no attack of colicky pain since then.

Comments

1. Anomalous development of the kidney in the sacral region due to a rest of nephrogenic element is not common.
2. When it occurs, specially in women, the greatest difficulty is found in diagnosing the condition and in differentiating it from adnexal tumours, specially ovarian tumours.
3. Paroxysmal pain of colicky type which the patient experienced for a long time was due to twisting of the mesentery simulating the chronic axial rotation of the pedicle of an ovarian tumour.

A CASE NOTE ON CANCRUM ORIS FOLLOWING PNEUMONIA TREATED BY PRONTOSIL*

By D. C. MAJUMDER, L.M.P. (Assam)
Daimukhia Tea Estate, Doom Dooma, Upper Assam

Introduction.—Cancrum oris following pneumonia is a rare condition. I have seen two other cases of cancrum oris in this practice, one following dysentery and the other idiopathic. Both died in spite of all treatment.

D. G., a female, aged 26 years, was admitted to hospital on 11th July, 1937, with definite signs of pneumonia of the left lung. Later on the right lung was also affected. Temperature, pulse and respiration returned to normal on the eleventh day of the disease, though she had coarse râles persisting in the lungs. On 11th August, *i.e.*, a month after, she was running a low temperature in the evening and on the 22nd she complained of severe pain and burning sensation in the right cheek.

On examination the cheek was found to be inflamed and a hard lump was felt. A boric compress was given. The next morning a white patch was noticed inside the cheek. The breath was foul. She was given a warm potassium chlorate gargle and (1 in 10) hydrogen peroxide, alternately along with the compress. The condition became progressively worse till a cancrum oris developed. On 30th August, the ulcer was cauterized as recommended by Rose and Carless (1924) but this had no effect. Her general condition became worse and the temperature ranged from 99° to 102°F., hæmoglobin went down to 35 per cent and the patient became toxæmic. It was decided to give a trial to Prontosil album oral (Bayer) and six tablets a day were administered. On the eleventh day of prontosil treatment the temperature touched the normal line and remained normal for five days but went up again for three more days and then dropped to normal till the patient was discharged from hospital. Prontosil was continued altogether for three weeks. Signs of toxæmia lessened from the third day of the treatment. Along with the decrease of temperature and toxæmia, the ulcer also began to heal up, and was completely cured after the completion of the treatment.

My thanks are due to Dr. H. Flack for his valuable help.

Reference

Rose and Carless (1924). *Manual of Surgery.* Baillière, Tindall and Cox, London.

* Read in a meeting of the Doom Dooma and Associated Tea Company's Medical Society held on 25th November, 1937.

A CASE OF ASCARIS LUMBRICOIDES INFECTION SIMULATING CEREBRAL TYPE OF MALARIA

By A. K. GHOSE, L.M.F., L.T.M.
Medical Officer, Ambari Tea Estate, Carron, Jalpaiguri District

On the 15th March, 1938, at about 5 p.m., a coolie girl about 8 years of age, while playing in front of her hut suddenly fell down unconscious. I was called at 7 p.m. and found her in the following condition :—

Completely unconscious. Violent spasms all over the body. Great struggling. Lock-jaw and sometimes tongue was caught between the teeth. Spleen not palpable. Temperature normal. Respiration and pulse normal.

From my previous experience I clinically diagnosed the condition to be due to subtertian malaria. I have seen cases of cerebral malaria even when the temperature is almost normal. I at once injected 7½ gr. of quinine bi-hydrochloride intramuscularly after taking a few blood films, both thick and thin. Next morning it was reported to me that the girl had vomited two live round worms at night; after which the symptoms of excitement much abated and she enjoyed some sleep. I examined the blood films but no parasites could be found even after prolonged search. I went to see her next morning at 7 a.m. and found her in a normal state. I asked her relatives to send her stool for examination when she passed one. Stool examination showed ova of *Ascaris lumbricoides* and hookworm in good numbers.

The sudden onset and sudden disappearance of the symptoms after vomiting two worms are the points of interest in this case.

Discussion

A. lumbricoides has been held responsible for various manifestations, for example, volvulus, intestinal obstruction, obstruction of the pancreatic or bile duct and diarrhœa with cholera-like symptoms.

It may also give rise to many nervous symptoms.

A CASE OF LOWER SEGMENT CÆSAREAN SECTION

By D. R. LEWIS, M.B., F.R.C.S.Ed.
Civil Surgeon, Maubin

Opportunities for delivery of a child by Cæsarean section occur in *mofussil* hospitals only extremely rarely and for that reason I consider the following case worth publication :—

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My assistant was called to see a deformed Hindu woman, aged 28, who was at full term of her first pregnancy and was said to have been in labour for the previous four days. On examining the woman he found that she had a contracted pelvis and he therefore advised her husband to take the patient to the hospital immediately, for delivery by operation. There is a great deal of reluctance on the part of Hindu women to seek treatment at the hospital and in this particular case the old *dai* who was in attendance on her, gave her the assurance that she would deliver her normally before that night and thus my assistant's advice was not acted upon by the patient's husband with the result that the next day she reached a critical state and had to be brought to the hospital.

When the patient arrived in hospital it was 5-20 p.m. on 5th March, 1938. Although she had been in labour for the past five days the os was dilated only to the extent of admitting two fingers. The child's head was found engaged. Fœtal heart sounds were heard, and were 168 per minute. The woman had a temperature of 101°F. and her pulse was 120 per minute.

An immediate Cæsarean section was decided upon and the patient was removed to the theatre. The abdomen was opened up by a left paramedian incision under spinal stovain and the uterus exposed. A transverse incision was made across the uterus at its lower segment after incising and stripping of the peritoneum and pushing up the bladder, the child was delivered by its head. The placenta was removed manually; but some part of the membranes was found adherent to the uterine wall and would not come off easily. The adherent membranes were scraped out with the fingers and the uterine cavity mopped out with gauze soaked in a 2 per cent solution of iodine in glycerine. The uterus was sutured with catgut and the abdominal wound closed in layers. As the uterus showed signs of sepsis an injection of 5 c.cm. of a 5 per cent solution of prontosil 'Bayer' was given intramuscularly.

The child was asphyxiated and had to be given artificial respiration for a period of 20 minutes before it started crying. Both the mother and child made uninterrupted progress.

A CASE OF TABES DORSALIS IN A HINDU

By MOHAN LAL PATHAK, M.B., B.S.
In charge, Police and Sub-Jail Hospitals, Lower Dharmsala, District Kangra

TABES DORSALIS is a rare disease in India. So it seems worth while to record this case.

In January 1936 the patient, S. R., 30, Hindu male, soda-water hawker by occupation, came to the surgical out-patients department of the Jubilee Hospital, Amritsar, complaining of painless swelling of the right ankle joint of two years' duration. From there he was referred to the medical out-patients department, where he was seen by me. He was admitted in the second surgical ward where a detailed examination was conducted.

Family history and personal history.—Nothing particular.

Past history.—In 1920, when only 14, he got three sores outside his prepuce after exposure, as the result of which he developed temporary phimosis. Some indigenous treatment was adopted which relieved him.

In 1928 he again developed two sores without any exposure which lasted for 15 days and subsided apparently without any treatment. Except this, there is no history of secondary or tertiary lues.

In 1933 he suffered from frequency of stools with marked tenesmus without any blood or mucus. He was given two courses of 12 injections each, of some medicine (emetine?) without any relief. The disorder subsided by itself after about three months. Possibly the attacks were rectal crises.

Then he noticed swelling of his right ankle for which, after trying various indigenous practitioners, he came to the hospital.

Examination of the nervous system. Motor functions.—Muscular power normal. Co-ordination perfect in the upper limbs, but defective in the lower limbs.

While sitting the head can be easily brought in between the extended legs, either leg can be made to form an acute angle with the trunk while the other leg is kept extended, fingers can be hyper-extended back to a right angle, indicating marked hypotonia.

Sensory functions. Superficial senses.—Dorsum of the toes, soles of the feet, perianal region, penis and scrotum are anæsthetic to touch, pain, heat and cold. Lateral border of the left foot, a band about 2½ inches in width on the left side and 1 inch on the right side at the level of the nipples extending right across the front and back of the chest and a small area on the medial aspect of right arm are partially anæsthetic. Cold is interpreted as heat on the lower abdomen, medial aspect of the arms and sometimes on the scrotum. Cotton-wool touch is interpreted as pin prick on the lower abdomen.

Deep senses.—Sense of position absent in the toes and ankles, impaired in the knees and normal in all other joints. Romberg's sign marked. Algometer sense absent on the feet, impaired on the legs and normal in other regions. Sense of vibration absent from toes and fingers, impaired in ankles, and normal in other parts. Asthesiometer sense is impaired on the legs and cannot be tested on the feet.

Reflex functions.—Deep reflexes.—Wrist extensor jerk is sluggish on both sides. Otherwise all the deep reflexes of upper and lower limbs are totally absent.

Superficial reflexes.—Plantar, bulbocavernosus and anal reflexes absent. Cremasteric reflex sluggish. Abdominal reflexes abnormally brisk. Epigastric reflexes normal.

Organic reflexes.—There is hesitancy of micturition. Sometimes urinary flow stops, to start again after a minute or so (vesical crisis). Sometimes there is incontinence of stools. Breathing normal except temporary attacks of dyspnœa (bronchial crisis?).

Pupillary reflexes.—Typical Argyll Robertson pupil.

Cranial nerve functions.—Sometimes the patient gets macropsia. Field of vision as tested by finger movements restricted on all sides.

Trophic changes.—There is a hard area about a pice in diameter on the soles.

Locomotory system.—Right ankle joint is swollen but not tender. The joint is flail-like. *X*-ray examination shows disorganization of the joint, destruction of bone ends and formation of new bone round about. Joint cavity cannot be differentiated.

Other systems normal on ordinary examination.

Blood—Wassermann + + −.

Cerebro-spinal fluid—Wassermann + + +.

Undoubtedly the patient was a typical case of tabes dorsalis.

The patient was given a full course of neosalvarsan with iodide and mercury by mouth, with no improvement. Then he was given 10 injections of sulfosin on alternate days. He got marked febrile reaction (temperature 103°F. or so) after every injection but without any improvement in his condition. If anything he was steadily growing worse. After about five months' stay in the hospital he was discharged with a plaster-of-Paris splint on his right ankle.

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I thank Lieut.-Colonel P. A. Dargan, I.M.S., the hospital superintendent, for permission to publish this case and Dr. Ganesh Sahai, the surgeon in charge of the case, for providing facilities to study it.

A CASE OF REPEATED ABORTION TREATED WITH VITAMIN E AND PROLUTON

By I. G. K. MENON, M.B., B.S.
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THE patient was a girl aged 24.

Previous history.—Subject always to severe dysmenorrhœa, worse before and on the first day of the period—loss of blood always profuse.

First pregnancy in 1934, three months after marriage. In the 11th week of pregnancy, bleeding started. Examination *per vaginam* showed a retroverted uterus, mobile. The retroversion was corrected and a pessary introduced but despite that and sedative treatment with calcium, viburnum, liquor sedans, etc., and perfect rest, complete abortion occurred, exactly one week after bleeding started. Loss of blood was alarming in its quantity. This occurred at about the time due for the periods.

Subsequently a pessary was worn for several months. She became pregnant again in 1935. Examination showed the uterus mobile and retroverted; so it was corrected and a pessary was worn early. Despite that and prophylactic calcium, liquor sedans, adexolin, etc., with rest, bleeding appeared in the 11th week of pregnancy as before, continued for one week and terminated in abortion. This time also, loss of blood was marked. The dysmenorrhœa was slightly less after these abortions, but still very marked. The pessary was not being used. In May 1936, about a year after the second abortion, vaginal examination showed the uterus mobile, retroverted and with a certain amount of retroflexion. A ventral fixation of the uterus was suggested but refused.

In August 1936 she commenced taking vitamin E, one capsule a day. Crooke's Collosol wheat germ oil capsules and Glaxo Laboratory wheat germ oil extract were used. It was noticed very soon that the dysmenorrhœa completely disappeared, the loss of blood at the periods lessened and, though no other tonics were being taken, her weight, which used to be very steady at 112 lb., increased in three months to 126 lb.

History of present pregnancy.—She had her last period in January 1937. After vitamin E the intermenstrual period was occasionally prolonged and so until 42 days of amenorrhœa pregnancy was considered doubtful. A vaginal examination on the 45th day revealed a uterus in the correct position with no retroversion or retroflexion and signs suggestive of pregnancy. Brownish stains occasionally taking deep red tinge were noticed at this time, even though the vitamin E was being continued. On the 55th day, fresh blood stains and backache were noticed and so next morning, 4 units of Proluton (Schering) were given intramuscularly. After that, no bleeding or even brownish stains occurred.

Bi-weekly injections of Proluton (2 units at a time) were continued till the 6th month of pregnancy while vitamin E was continued till the 8th month, in addition to adexolin and calcinol. Weak pains started at 7 p.m. on 277th day and an easy normal delivery took place at 2-30 p.m., on the 278th day of pregnancy. The baby was a female child weighing 6 lb. Loss of blood was less than the average and the puerperium was uneventful.

The baby was noted to be quick in its development in all respects. She has been fed entirely on breast milk so far and has progressed from 6 lb. at birth to 17 lb. in her 5th month.

The interesting points in this case are :—

1. The correction of the retroversion without any reposition or pessary, after vitamin E. It would seem as if deposition of fat in the broad ligament and increased tone of the supporting ligaments resulted after vitamin E in this natural correction.

2. The complete cessation of bleeding with Proluton treatment in spite of the failure of all other usual methods in the previous two abortions and even of vitamin E in this instance.

[*Note.*—Whilst the possibility cannot be denied, the evidence of the specific action of vitamin E in this case seems to be lacking.—EDITOR, *I. M. G.*]

A CASE OF PELLAGRA SUCCESSFULLY TREATED WITH INTRAVENOUS INJECTIONS OF SODIUM THIOSULPHATE

By D. R. LEWIS, M.B., F.R.C.S.Ed.
Civil Surgeon, Maubin, Burma

S., a Hindu male, aged 20, a native of Fyzabad district, sought my advice on 1st May, 1938, for raised symmetrical patches of discoloration on the dorsal aspect of his hands, forearms, legs and feet. He gave the history that two months ago he noticed dark patches, about the size of a rupee, on the dorsal surface of both wrists and ankles. The former spread upwards towards the elbows and the latter towards the toes. A fortnight later new patches appeared just below the neck, on the outer surface of both knees and behind the elbows. The patches on the knees began to spread upwards and medially.

At the time of examination the patches on the feet, wrists, knees and elbows appeared black and the skin was dry and coarse. There was no pain except itching sensations on exposure to sunlight. There were also discrete patches on the forehead and cheeks, and two on the chest, one on the manubrium sterni and the other at the root of the neck on the left side. These patches were smooth, but deeply-pigmented dark brown. The central area was less pigmented than the periphery. They appeared ring-shaped.

He had small areas of leukoplakia at the angles of the mouth, the one on the right side being more marked.

The nails were normal.

He stated that for the past month he had lost his appetite, did not taste his food and was not able to digest it.

The bowels were regular. The urine was scanty and high coloured, and there was a burning sensation during micturition.

The patient has been in this country for the last four months. His usual diet in India was rice and *dâl* and he takes the same diet here too. He is a vegetarian, belonging to the *durwan* class, with low resisting power.

Treatment.—For this particular patient I chose intravenous injection of sodium thiosulphate as recommended by Sabry; no other treatment, medicinal or dietetic, was given.

He was admitted into the hospital on 2nd May and was asked to continue his old diet of rice and *dâl* obtained from the same source. He was given 10 c.cm. of a 10 per cent solution of sodium thiosulphate twice weekly. The first effect noticed was that the patches began to change colour. What was originally black now became brown and what was brown became erythematous. A few days later all signs of pigmentation and erythema passed off. There was a sense of well-being. His appetite returned as well as his powers of digestion. The sites of the original patches on the feet, elbows and ankles are still rough to the feel. Those on the knees and wrists are less rough. The more recent ones on the chest, face and back of the neck have completely disappeared.

The patient gained 9 lb. during his treatment.

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Indian Medical Gazette

OCTOBER

THE TREATMENT OF LOBAR PNEUMONIA

A QUARTER of a century ago the general attitude towards pneumonia was a fatalistic one and is reflected in the saying of Sir William Osler that pneumonia is the 'old man's friend', the implication being that this disease removes him rapidly from the world when his life is becoming a burden to himself, as well as to others responsible for him. The treatment for the disease was 'expectant' and consisted of little more than nursing and the judicious—and also unfortunately injudicious—use of alcohol and digitalis.

It may have been just the steady advance of medical science in which the investigation of this disease took its turn, or perhaps it was the terrible toll of life amongst people of all ages taken by pneumonia in the great influenza epidemic of 1918 that stimulated us; whatever was the cause for this change, there has been a very decided change of attitude and the treatment of lobar pneumonia has been engaging the serious attention of the medical profession in many western countries during the last decade or so, but it is in the United States that there has been the greatest concentration of effort. This is very easily understood, for the mortality rate seems to be higher in North America than in any other part of the world where the conditions can be said to be comparable. At the beginning of the century the death rate, for all ages considered together, was in the thirty per cents in large American hospitals and in the twenties in the corresponding London hospitals. Then, again in America not only have the large research organizations put pneumonia second only to cancer in order of importance as a subject for research, but the large hospitals, the universities, and the federal and state health authorities have undertaken extensive enquiries; and most significant of all even insurance companies have considered it a sound commercial proposition to undertake or to assist financially schemes of research aimed at placing the treatment of this disease on a sound footing.

An essential prelude to the introduction of serum in the treatment of pneumonia was the recognition of the different serological types by Lister in South Africa, and by Dochez and Gillespie in the United States. This knowledge was essential even for the preparation of a polyvalent serum, but time has shown that it is only by the use of homologous sera that any significant reduction in the death rate can be effected.

Experience of the last three years has established beyond any doubt the value of anti-pneumococcal serum. The death rate from lobar pneumonia shows very considerable variation in different circumstances: it varies from almost *nil* in the child to almost 100 per cent in the aged, and in any one age group it will show marked variation from place to place and from time to time, but in the healthy adult male between 20 and 50, economically the most important group, it can probably be said that where efficient serum treatment has been given the death rate has been nearly halved.

The success of the treatment depends on the time of administration of the serum and on the number of units of homologous antitoxin that the serum contains; unless it is given within the first few days and in adequate amounts it is of little value. There is a close association between these two facts. In order that a sufficient number of units may be given in a reasonable bulk of serum it is important that a univalent serum should be used, and this necessitates the ascertaining of the type of infecting pneumococcus, which in its turn means delay.

If the serum is not given within the first three days the chances of success are considerably reduced. There is often some delay before a patient comes under medical observation and if to this has to be added about twenty-four hours that the standard methods of typing usually take, the number of patients receiving the full benefit of the serum will be few. Armstrong's method of direct 'typing' with the pneumococci-laden sputum of the patient and high-titre type sera can be done in a few minutes, but even in these circumstances the requisitioning of the services of an expert bacteriologist and the collection of the necessary materials will take some time. To overcome this difficulty, in some American states, they have organized a state pneumonia treatment service on which any doctor can call for assistance in ascertaining the type and for the provision of anti-pneumococcal serum. No such elaborate organization exists even in England and it could not be contemplated in this country.

In the past the horse has been used for the preparation of anti-pneumococcal serum but recently the rabbit, which was used only for the production of high-titre serum for typing, has been shown to be capable of producing a serum that is therapeutically very active. The rabbit serum was used at first only in patients known to be sensitive to horse serum, but recently it has been claimed that rabbit serum is far more effective than horse serum, and in a series of sixty-nine adults, Loughlin, Bennett and Spitz of Brooklyn claim a mortality rate of only 7.4 per cent, and say that no patient who received the serum within 96 hours died.

A very serious drawback to the serum treatment of pneumonia is the high cost of the serum. There is no reason to suppose that this cost is an artificial one and capable of reduction to any important extent; the production of serum of sufficient potency may take as long as two years and horses sometimes die in the process. One

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hundred thousand units may be looked upon as almost the minimum effective dose and in many cases 200,000 units, 300,000 units, and even larger dosages are given. The retail cost of 100,000 units is about 45 dollars in America and it is certainly not less in India.

Another serious complication is the multiplicity of types; these number well over thirty now. Admittedly, in England and America between a half and two-thirds of the cases will be type I or II and the large majority of the rest fall into about four 'higher' types. This not only adds to the difficulty of identifying the types but means the stocking of a large variety of homologous sera. In India, matters are made worse by the fact that types I and II are not the common types, and in a recent investigation only in about one-quarter of the cases of pneumonia were type I or II pneumococci found to be the infecting organisms, and in yet another series the proportion was as low as 12 per cent.

All these facts taken together seem to us to rule out anti-pneumococcal serum altogether as a practical solution to the problem of the treatment of pneumonia in India.

A paper recently appeared in these columns which suggested that the early use of vaccines might be of some value, and in the milder forms of the disease—which are undoubtedly the rule in India—the writer reported considerable success in a small series. As this method of treatment is not generally looked upon with favour outside India, we hesitate to recommend it at present. It is in any case essential that this vaccine should be made from virulent cultures of the types most prevalent in the neighbourhood. It is hoped that further reports of this method will shortly be forthcoming, and that they will be equally favourable, but meanwhile we must control our optimism.

Are we then to be thrown back on the old expectant methods 'with the judicious use of alcohol and digitalis', to which is now added intravenous glucose and the liberal use of oxygen? The present trend of opinion is that the most judicious use of alcohol and digitalis is to keep these two substances in their respective bottles. The American opinion seems to be almost unanimous that the results have been much better since alcohol was given up altogether, and in Great Britain even those who do not take this extreme view usually consider that the psychological and sleep-producing effects of alcohol are its main recommendations. Similarly, the giving of digitalis is looked upon by the majority as adding another poison to the already poisoned heart, but opinion on this point is not unanimous.

The opinion about oxygen has also undergone a change; but in a reverse direction, and from being divided and sceptical, it is now unanimous and definite. The previous unsatisfactory position of oxygen therapy was due entirely to the totally inadequate methods by which it was given, and these methods are still used widely in India, though in some of the larger hospitals better methods are now being introduced. No benefit whatsoever is obtained from the oxygen if a funnel, attached directly to the oxygen cylinder—so that the rate of oxygen delivery is unknown, is waved nonchalantly and occasionally by a nurse or attendant some few inches from the patient's face. It is seldom given until the patient is moribund and beyond the help of any oxygen, and it is therefore not surprising that in Indian hospitals and households the ordering of the oxygen cylinder is tantamount to ordering the undertaker. Any momentary improvement that is observed can probably be accounted for by the stimulating effect of the air movement. The psychological effect on the patient and his relatives is the very reverse of stimulating and the only person benefited is the physician who appears to be able to go home with a feeling of satisfaction—to which he has incidentally no right—that all that is humanly possible has been done.

Oxygen tents should certainly be available in the larger hospitals in India, but their use will be limited to the cooler months of the year unless they can be combined with some system of cooling the air and maintaining air movements. The mask is unsatisfactory and not well tolerated, but the nasal catheter is usually well tolerated by patients, particularly when they have once experienced the relief that is given by this measure, and it has in addition the great advantages of simplicity and low cost.

A no. 10 or smaller catheter is used, additional holes should be cut so that the stream of oxygen does not play on one spot in the mucous membrane; the catheter should be passed well into the naso-pharynx: and the supply of oxygen should be liberal, about 2 litres a minute. If no special apparatus is available the oxygen can be bubbled through water in a flask or Woulff's bottle. The statement that the rate of bubbling should be a little faster than one can count is most misleading and liable to end in an inadequate amount being given. (The rate can be tested by noting how long it takes to empty a 500 c.cm. flask—or other receptacle of known capacity—filled and inverted over a bowl of water when oxygen from the catheter is passed into it: it should take 15 seconds in the case of the 500 c.cm. flask.) *In all cases oxygen should be started early and should be given continuously.*

The introduction of sulphanilamide in the treatment of hæmolytic streptococcal and allied infections opened up a new vista in chemotherapy, and drugs of this group were naturally tried in pneumonia. Britton, Buttle, Gray and Stephenson, and others in Britain, and Cooper, Gross and Mellon, and others in America testing sulphanilamide experimentally and clinically against pneumococcal infections obtained inconclusive, but suggestive, results. The experiments were extended to other allied compounds and early this year Whitby found that a compound,

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2-(*p*-aminobenzene-sulphon-amido) pyridine, had much more marked protecting action in mice injected with 10,000 lethal doses of different types of pneumococci than other compounds hitherto tested. More recently this drug, now known as 'M and B 693', has been used clinically in pneumonia with some very promising results.

It is too soon to be jubilant about this particular compound, but we are certainly entitled to be optimistic regarding the future of chemotherapy in this disease. The very great advantage of the drugs of this group is that they are not expensive and it seems possible that herein lies the solution to the problem of the treatment of lobar pneumonia in this country.

Special Article

MENTAL HYGIENE AND ITS SIGNIFICANCE

By R. M. KASLIWAL, M.D. (Luck.), M.R.C.P. (Lond.), D.T.M. & H. (Eng.)
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EACH and every one of us lives in two different worlds, one which is common to us all and another which is entirely of one's own creation. In fact, this latter world is more important and dearer to us than the common world. We cling to our ideas and ideals, our thoughts and notions almost as tenaciously as if ours were the only right and just world. It sometimes hinders and sometimes helps us in understanding each other's point of view. It often prejudices us to such an extent that we are unable to visualize things in their true perspective. It even modifies our impression about the common world. It is, in fact, as responsible for our happiness as for our unhappiness, and yet if we face the facts squarely, we can safely say that practically no hygienic measures have been introduced into this country to stop the accumulation of the so-called misconceptions, inner conflicts and repressions in order to prevent future misery and mental disease.

During the last two or three decades much attention has been paid to the eradication of disease by laying stress on the preventive side of medicine, but little has been done or is being done for the prevention of mental diseases proper and the so-called neuroses which are increasing rapidly as life becomes more complex, and for some of which society is as responsible as for the germs of physical disease.

Society is at present shirking its responsibility with regard to these social diseases and it is now high time that the medical profession in India, with the mutual co-operation of public bodies, should take a lead in the preventive side of this branch of medicine, just as they did when the modern hygienic measures were introduced for the prevention of infectious diseases.

It is only by the development of this aspect of hygiene that so much misery, unhappiness and disease, which is to such a great extent the result of clogged mentality, can successfully be dealt with. On it will depend the development in the future of well-balanced normal minds, fully equipped to meet the trying exigencies of our lives.

We are the product of our breeding and environment. The question of breed, which is of such great importance, will not be dealt with here. It comes under the purview of eugenics.

Although seed is of prime importance the external influences, home surroundings and other environment are of equally great importance for the proper development of human mentality, and therefore it is difficult to say which of the two deserves the first place.

The mind starts developing from the time that the fœtus is in the womb. Excessive worry, malnutrition or other untoward effects to the mother have all been known to be reflected in the child in the form of certain aberrant traits appearing when the child is born and grows up; thus for the proper development of the baby the mother ought to be in perfect physical and mental equilibrium.

The most important duty of the parents begins when the child is born. The mind undergoes a rapid development during the infantile period, and in order to give full scope for its development no undue hindrances and obstacles should be imposed upon it. It should be recognized that the child is only a young animal and that impressions created at this stage may modify his whole future life. Two opposite powerful forces are dominant in the mind at this period; one is the sense of dependence and the other is that of independence. They are both biological and primary and the so-called adult 'misfits' are a result of the failure of parents to recognize the ruling power of these primary impulses. When a baby cuddles in his mother's arms he is relishing the sense of dependence and automatically maintains a feeling of satisfaction and comfort and recognizes protection in his parent.

If at this period the parent hurts the feelings of the child unduly, as is commonly done by careless mothers in beating their babies or neglecting them, the image of worship formed in the child's mind falls to pieces. The loss of this impulse creates a burst of negative independence. Such a conflict or event may prove to be the starting point of the future neurotic adult individual who views everything with distrust and who finds it difficult to adapt himself to his surroundings. Similarly, an overbearing attitude of the parents to their children collides with their sense of independence and interferes with their proper maturity; thus these children on reaching adult age are still living in the infantile

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period of protection and dependence, and are unable unaided to meet the problems and exigencies of adult life. It should therefore be clearly understood by all parents that their relationship with their children is of vital importance and it should be of such a nature as not to interfere with the primary forces and impulses of the child, which should be given proper scope for development. The irrational behaviour of parents, both in the domain of permission and prohibition, should be censured and there must not be too much of either. That excess of everything is bad is an obvious truth, and this should be the guiding principle of the parents in their relationship with their children.

As the child grows, the surroundings domestic, social, economical, psychical and spiritual exert a good deal of power in moulding his mentality. Recent advances in psychology teach us that when there is perfect harmony between the individual and his environment the development of mentality takes the proper channel resulting in future happiness and peace of mind. On the other hand if there are destructive stimuli operating on the individual, he is unable to adapt himself to his environment, which ultimately results in mental conflicts and confusion, and subsequently misery follows.

This has been very aptly emphasized by David Seabury who writes that, 'A right relation of the self to surroundings is a primary factor in the direction of inherited impulses and the release and guidance of inner powers'. One so very often sees the results of the suitability and unsuitability of such surroundings among children of happy and unhappy families.

In the light of modern research also it is now known that it is not necessary for the environment to be a good one but it should be such as is suitable to the individual. What may be good for one individual need not necessarily be good for another. Personal needs and requirements vary according to one's inherent tendencies and, in order to give the inborn elements the fullest opportunity for growth, one's surroundings must be suitable. The influence of home surroundings and other environment on an individual, especially in the formative period of his life, is therefore of great importance, and the parents should realize the importance of the presence of primary impulses within their children which, instead of being repressed, should be given the fullest opportunity for normal expansion.

As the child grows into a man the importance of a healthy environment still holds good. Happiness, present and future, proper mental development and correct perspective about things develop only if the environments through which the person has gone were healthy. Many a genius has been allowed to rot and sane-minded persons turned cynical owing to the unhealthy mental atmosphere through which they have passed.

What constitutes a healthy mental atmosphere is another important question. It probably differs with different individuals but approximately it should be made up of peaceful, pleasant and comfortable home surroundings combined with sufficient suitable work and a congenial social environment. In no stage of the life should the undue dominating influence of anybody be allowed to continue. Every one of us is familiar with the domineering influence of a parent or a friend and the results thereof. Such an individual is not given an opportunity to develop his own personality, with the result that when he goes out into the world, he finds it difficult to make a start and is always looking for assistance. All of us have at times sensed that a particular atmosphere is stimulating or undermining us, and for the sake of avoiding the detrimental effect of an undermining or a dominating atmosphere one must get away from such a situation.

Besides this factor of environment, which plays a great part in the moulding of mentality, there are certain internal feelings which also exert an equally important influence. Worry and pessimism always keep us alive to our troubles. They have a very maiming effect on our mental processes. Though it is easier said than done, as far as possible every effort should be made to avoid this pernicious habit of worrying. A cheerful and optimistic attitude towards a troublesome situation helps matters to a very large extent, whereas worry and pessimism only put extra hindrances in the way and clog the whole mentality. One cannot see all the points of a particular issue nearly as well when one is worried as when one is calm. An inveterate worrier gradually becomes very introspective and ultimately becomes a neurotic or a hypochondriac. It is natural to worry about certain important problems. To worry to a certain extent is normal but when a person worries too much and worries about trifles he transgresses the normal limits, and it is then that it begins to tell on his mental faculties. Individuals should therefore be shown the evils of this habit, and should be instructed how to avoid it as far as possible.

Brooding over past unhappy events is another bad habit which has a very detrimental effect on our mental faculties, particularly memory. Continuous mental repetition of past unhappy incidents and fighting imaginary battles takes away not only the peace of mind at that moment, but makes the person apathetic and bad tempered for the rest of the day. It is as if the incident has occurred again the same day. Such mental rumination ruins the happiness and peace of mind which is a very important factor in keeping the mental processes in good order.

'Inferiority complex' is familiar to all of us, and it would therefore be interesting to know how it breeds and what ravages it produces in the mental atmosphere. It is more often relative than absolute, meaning thereby that it may be noticed in an individual under certain circumstances only, and not always. It is a matter

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of common observation to notice it in an individual in the presence of a particular person or society, whereas nothing of the kind is manifested by him in different company. It is to a certain extent normal, and becomes apparent only when a person feels himself a little strange and unadapted to a situation, and as soon as he is removed from that situation to a more congenial one he once again assumes a normal attitude. It is only when the complex takes a severe turn and operates in all situations, that is, when it becomes a part and parcel of the individual, that it becomes a psychological problem. In almost all these cases it is the result of some underlying repression which may be either in the form of some unfulfilled wish or an organic inferiority due to some physical defect.

It is also commonly observed that in order to conceal or avoid their inferiority these individuals sometimes develop the 'superiority complex' which may be manifested in one of several ways. The bully, the swashbuckling and boasting type of individual, the person who talks too much of his physical powers and attainments, the so-called ascetic and various other individuals in different aspects of life sometimes adopt this characteristic superior attitude just to hide their sense of inferiority. This is an outcome of some form of unhealthy condition of the mental atmosphere which, by proper mental hygienic measures adopted in early childhood, could to a certain extent be prevented from appearing in the adult, and thus save a great deal of mental unhappiness to the individual in particular and humanity in general.

Similarly, there are many problems occurring in everyday life which are chiefly the outcome of clogged mentality and which keep us unhappy in our already so-called unhappy world, and if, by proper care and mental hygienic measures, these problems could be prevented and removed what an immense amount of misery would be lifted from our shoulders.

It is therefore necessary that, with the modern advances already made in this branch of medicine, steps should be taken to introduce them for the general welfare and utility of the people, and psychological clinics and other places where regular mental hygienic work can be carried out should be started in India.

Medical News

CALCIUM LACTATE AS A MILK SUBSTITUTE

EXPERIMENTS carried out by the Nutrition Research Laboratories, Coonoor, on a group of south Indian school children, who were given a daily dose of calcium lactate instead of milk for a period of three to four months, show that the children increased in height and weight as compared to other groups which received no calcium lactate. It was found that the calcium lactate groups put on more weight, and showed also a slight increase in stature.

The calcium lactate had a good effect on the general condition of the children although the calcium salt does not, as might be expected, equal milk in value as a supplement. It does however help to make good one serious deficiency, and is a *partial* milk substitute.

What it costs

To supply a child with a daily drink of 8 oz. of liquid skimmed milk reconstituted from powder costs about 12 annas per month. The supply of such milk in schools on a large scale would mean considerable expense. Children who need milk most are those whose parents can least afford it.

In the experiments with calcium lactate half of one gramme of calcium lactate was given daily, at a cost of about half to one anna per child per month. This is by no means a large expenditure and the regular administration of a calcium salt might be feasible even in the poorest schools. Milk is best, but in present circumstances, calcium lactate is better than nothing. Its provision may be recommended to Educational Departments and other organizations concerned with the care of children. The calcium salt could be dispensed rapidly and easily from a tin with a spoon of suitable size.

A daily dose of calcium lactate may benefit children in other countries besides India. It would probably make a very useful dietary supplement for children in Africa and many other parts of the world, for whom milk is not available, and whose staple diet is rice or some other food deficient in calcium.

The Coonoor experiments suggest a new approach to the problem of malnutrition among such children.

MEDICAL SUPPLIES BY AIR. RAPID AID IN EMERGENCY CASES

THE air transport of serums and vaccines has recently shown a remarkable increase, according to a traffic census made by Imperial Airways.

Practically every day great manufacturing houses in London send medical supplies by air not only to European countries but to the remotest parts of the world, frequently right into the heart of the bush.

Not the least interesting aspect of this traffic is the humanitarian part played in the saving of life, as, for instance, when serums are needed to combat diphtheria or scarlet fever epidemics away from civilized centres.

Without air transport it would be impossible to cope with sudden epidemics or accidents that occur in remote districts. To-day, with regular air services available, doctors ask confidently for the rarest serum, knowing that it will be in their hands in a few hours.

It is not practicable to keep many of these preparations in stock. Apart from being 'short-dated', they are also extremely expensive. One bulb often costs as much as £4.

An example of these emergency calls was provided only last week, when distemper broke out in a kennel of very valuable dogs in the Straits Settlements. By the next available flying-boat from Southampton there was rushed out a supply of virus. As the virus must be alive and fully active at the time of injection, there is a vital need to expedite delivery. When taken by air, the journey time is cut down from weeks to days, and from days to hours.

In Cyprus some time ago there was an epidemic of meningitis, and Imperial Airways flying-boats carried out considerable quantities of meningococcus serum.

Supplies of gas gangrene anti-toxin have recently been sent to Spain; and every week typhoid and cholera vaccines and serums are despatched by air, both for prophylactic and treatment purposes.

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Not all these preparations, of course, are intended for a sudden emergency, which shows that air transport is being used in a routine manner for restocking and normal usage.

The large medical supply houses are specially organized to deal with air consignments. Cables from abroad are immediately telephoned by the cable company, prior to the delivery of the cable.

An instance of the speed of working was seen when a London firm of manufacturing chemists received an urgent call from Stockholm for a certain serum. The serum left the premises in exactly 13 minutes, and was in Stockholm a few hours later.

A few weeks ago surgeons in a hospital in Africa were in urgent need of a certain type of anæsthetic which could only be procured from a certain laboratory in the United States. In response to an urgent cable, a supply of the anæsthetic was sent immediately by train to the nearest air-port, flown to New York, and carried across the North Atlantic by ocean-liner. On reaching England an Imperial Airways air-liner continued the journey by flying the preparation to an air-port in Africa. The final stage to the hospital was completed by fast car.

To take another aspect of the use of air transport for medical purposes, doctors have found that patients whose condition would make a surface journey dangerous, are able to travel by air without suffering any ill-effects. There have been many recent incidents of patients coming to England by flying-boat to undergo operations or certain forms of treatment.

Special accommodation can be provided for patients in these big flying-boats, and an air journey from abroad is made so quickly and with such absence of fatigue, that patients arrive in London without having suffered any discomfort whatever.

A case in point was that of a diver who, as a result of being brought to the surface too quickly, contracted caisson disease. He had to be rushed back to England by air for treatment at a London hospital.

It is quite a normal procedure to-day for London medical men to make use of specially-chartered ambulance 'planes for sending patients over to receive treatment at continental clinics. Taken by motor-car from a nursing home to Croydon air-port, and transferred immediately to a waiting ambulance 'plane, a patient can reach in a few hours' flying some destination on the other side of the channel. The experienced pilots who fly these air ambulances take them up to heights where smooth, swift journeys are assured.

One of the most interesting services in the world is the special air ambulance service operated in Australia by the famous Inland Mission. Not only does this mission employ fast aircraft to carry doctors and nurses to urgent cases, and ambulance aircraft for the transport of patients requiring urgent hospital treatment, but it now has at its disposal larger aircraft fitted up as complete operating theatres.

This means that when a patient is hundreds of miles from the nearest hospital, and his condition so grave that he cannot be moved, an aerial operating theatre can be flown to the spot and an urgent emergency operation performed without the need to do more than carry the patient into the aircraft.

SUMMARY OF TUBERCULOSIS NEWS FOR THE MONTH OF AUGUST 1938

The executive committee of the International Union against Tuberculosis, Paris, offered a biennial prize of the value of 2,500 French francs (in memory of the late Professor Leon Bernard, who was the founder and for fourteen years the secretary-general of the Union) for an original essay in English or French on the 'Social aspects of tuberculosis'. Thirteen entries were submitted from India through the King George Thanksgiving (Anti-Tuberculosis) Fund.

The executive committee of the International Union has decided to award the prize to Dr. Karl Fischel (United States), Dr. E. Arnould (France) and Dr. J. B. McDougall (Great Britain).

2. *H. E. the Marchioness of Linlithgow's Appeal for the King-Emperor's Anti-Tuberculosis Fund*

The Bombay Field Club has organized an exhibition of photographs of places of historical and archæological interest throughout India, Burma and Ceylon. The proceeds of the exhibition will be given to the King-Emperor's Anti-Tuberculosis Fund.

His Highness the Nawab of Junagadh has sanctioned a scheme for a lucky bag in aid of the King-Emperor's Anti-Tuberculosis Fund.

The 16th list of subscriptions issued by the Honorary Treasurer of the Fund shows that the amount actually received by him up to 31st July, 1938, was Rs. 51,16,968-9-9.

THE SAIDAPET HEALTH ASSOCIATION

The Saidapet Health Association realized in 1933 that if a group once becomes involved in caring for the severely afflicted it becomes almost impossible to divert time and effort to discovering and removing the causes that brought the affliction to the people. The Saidapet Health Project has therefore steeled itself against expending its efforts upon present effects. For five years it has concentrated upon a detailed study of Saidapet and causes that might prevent healthy living.

The material presented in their report describes the work of what has come to be known as the Saidapet Health Project. This is a joint enterprise of several medical and social service agencies which have pooled their resources and workers in an effort to discover ways and means of raising the level of the social and health life of a small town in South India. The report is issued in the hope that it may be of use to others working along similar lines.

The basis for the study

This preliminary health study of Saidapet is not offered as a survey that has discovered conditions, and emphasized or remedied them; it is published because the doctors and social service workers undertaking it are searching for a technique which may be useful here and elsewhere, in helping the residents to make better homes, and therefore a better town.

Saidapet appears to be, in its religious, social and economic framework, a typical small town in South India. The residents work hard for their living. There is a general air of friendliness and goodwill. Due to former municipal difficulties the rate of taxation is high. The sanitary and health level is low, though the difference may be only apparent, not real.

In conducting our survey we have kept these questions in mind:

(*i*) The Government Dispensary in Saidapet is a busy place. Nearby in Madras are the famous hospitals of the Presidency. Yet people use them only in emergencies. The dispensary is clean, yet up to its walls crowds the bazaar, insanitary, uninfluenced and unchanged. What can be done to carry the influence of the dispensary beyond its walls? How may fear of hospitals be overcome?

(*ii*) A vigorous campaign is yearly carried on by the municipality against cholera, smallpox and enteric fever. Co-operation is indifferent; hence the epidemics are controlled, not eradicated. What can be done to arouse interest in preventive measures?

(*iii*) Leprosy is a fairly common affliction in Saidapet. Is the incidence higher than elsewhere, or would similar surveys reveal similar conditions? Heretofore the control method has been isolation. To isolate the large number of wage-earners concerned in Saidapet would be an economic catastrophe even if funds were available to make it possible. Can Saidapet be used as a research laboratory for the study of leprosy in the situation in which it arises?

(*iv*) Filariasis is very common in Saidapet. The cause is known, but at present the cure is not known. Is it possible to use Saidapet as a laboratory for research which will bring the knowledge required?

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(*v*) Can constructive use be made of the handicaps under which Saidapet struggles? Health measures undertaken to date, though sound, have not aroused interest or the co-operation of the public. But everyone in Saidapet is interested in the control and cure of leprosy. This is clear from the keen interest shown and the co-operation given in the first house-to-house survey conducted by the Saidapet Skin and Leprosy Relief Association, now the Saidapet Health Association. This interest and co-operation grows steadily.

(*vi*) One final question may be formulated in the light of the foregoing:—Is it possible to use the concern for leprosy as a lever to lift the health level of the entire community? The measures necessary to control it will benefit everyone, and will, if adopted, make Saidapet a cleaner and a healthier town in which to live. But to achieve success all sides of community life must be approached, with emphasis upon all the healthy aspects, and an attempt to change all the unhealthy details.

MEDICAL REVIEW FOR INDIA

AN Indian Medical Review, the first attempt of its kind in the history of modern medicine in India, containing information on all matters of interest to the medical, nursing, pharmaceutical and allied professions, will shortly be published by the Director-General, Indian Medical Service.

Hitherto the various provinces and the Indian States have been publishing annual records of the activities of their respective medical and public health departments. The Public Health Commissioner with the Government of India has also been publishing annual reports dealing with the incidence of diseases, and vital and health statistics, but a review of the type now to be published is a new departure, and hopes are entertained that the publication will fulfil a great need.

The subjects, which it is proposed to include, cover a wide field from administrative organizations in the provinces and at the centre to statistics relating to medical colleges, hospitals and dispensaries in British India and to those under the control of the Political and External Affairs Departments of the Government of India and Mission Medical Institutions.

All about the medical world

Detailed information, it is understood, will be given in the publication about the medical profession and medical services of India, hospitals, dispensaries and nursing homes, with special reference to facilities for rural medical relief, a subject of vital interest; medical inspection of school children, post-graduate training of medical officers; *x*-ray and radium facilities available in India; mental hospitals and psychiatric clinics; scales of fees received from patients at the various Government hospitals; legislation for the control of practitioners of the Indian systems of medicine; Provincial and Central legislation regarding the registration and control of practitioners of the modern western system of medicine and surgery; medical education of men and women in India; history and activities of the various medical colleges and schools; the system of training of nurses, their examination, registration and conditions of service; facilities available for maternity cases and training of the midwife and the *dai;* history and activities of the important research institutions and of the Imperial Serological Department; control of pharmacy and drugs; and the work, methods and organization of the numerous medical and cognate societies.

THE JOURNAL OF INVESTIGATIVE DERMATOLOGY

ACCORDING to the 'announcement' this journal is the outcome of several years' consideration of American dermatologists on the formation of a new society and journal to be confined to dermatological research.

It is claimed that both society and journal cover a new field. This seems not strictly correct for it is rather the splitting off from the subject of dermatology a section that up to the present appears to us to have been adequately dealt with at the ordinary meetings of dermatologists and in ordinary journals on dermatology.

However, American dermatologists probably know better than anyone else what are their needs so it is not for a foreigner to criticize this new venture. But it means that most workers outside the United States will be debarred from knowing what advances are being made in that country, for few will be prepared to increase their already heavy annual bill on standard journals of dermatology by another 6 dollars a year.

The first number contains five articles, two from abroad and three from the pen of American writers; as a sign of the present trend in dermatological research four of the articles are on the subject of allergy in one or other of its aspects.

The first number is printed and produced in the well-known and pleasing style of the Williams and Wilkins Company who print so many American scientific journals, and to anyone with a long purse and plenty of library accommodation we recommend this new journal.

MYCOPATHOLOGIA

THIS is a new journal which is apparently to be devoted to papers dealing with mycology only.

As the paper will be published in the language of the contributor, and as it is edited by two Italians and published in Holland, one will need to be an accomplished linguist to be able to use the journal efficiently. However, there are summaries in English and other languages of many of the papers.

Whilst the criticism applicable in the case of all specialist journals, namely, that they encourage the segregation of the special subject, is applicable in this case, we have little doubt that it will serve a useful purpose as a repository for highly technical papers on medical mycology. It is a great help to the specialist to have such papers collected in a high-class journal of the kind this one promises to be.

RECEPTION COMMITTEE OF THE XV ALL-INDIA MEDICAL CONFERENCE, MEERUT

Organizing Secretary: Captain R. N. Bose, M.B., Garvie Medical Library, Town Hall, Meerut, U. P.

THE next All-India Medical Conference is holding its 15th session in Meerut during Christmas week.

Besides the General Section and the Exhibition, there will be a Scientific Section where original papers will be read and discussed thus affording an excellent opportunity for members to exchange opinions with members of the profession working in different parts of India.

The scale of fees is as follows:—

		Rs.
1.	Membership of Reception Committee ..	10
2.	Delegate from a Branch of the Indian Medical Association	5
3.	Other member of the Indian Medical Association attending the Conference ..	5
4.	Non-member of the Indian Medical Association attending the Conference ..	8

Any medical man or other scientist can also take part only in Scientific Section on payment of a fee of Rs. 5 only.

If anyone intends to contribute a paper, a typed copy of the same with an abstract of not more than 200 words and membership fee may be sent to the organizing secretary and the title of the paper sent in as soon as possible. There will also be sub-sections of the different branches of medical science. Anyone wishing special arrangements to be made in connection with their papers should let the secretary know in good time.

The papers will be the property of the Indian Medical Association and will be published in the *Journal of the Indian Medical Association* at the discretion of the Editor.

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BENGAL COUNCIL OF MEDICAL REGISTRATION

1. THE Council of Medical Registration, Bengal, submitted to Government in October 1934, their recommendations for a re-allocation of its constitution under section 4 of the Act, and for the removal of some working defects by amending the Bengal Medical Act of 1914. The recommendations were repeated in their resolution of July 1936 and February 1937.

2. The Council in their resolution of January 1937 and July 1938 recommended to Government an amendment of section 19 of the Act so as to make it clear that the Council has the power to recognize or withdraw recognition of medical schools.

3. The Council's proposal for raising the fee for entry of additional medical qualifications from Rs. 5 to Rs. 25 was sanctioned by Government in February 1936.

4. The Council by a resolution in February 1937 decided upon a scheme of improving the standard of training for the Licentiates, proposing *inter alia* for raising the preliminary qualification to I.Sc. with physics and chemistry, and extending the period of the medical course from four to five years. The recommendation was repeated by a further resolution in January 1938 when it also proposed that a deputation should wait upon the Hon'ble Minister in charge to explain the urgency of the question.

5. In their resolutions of July 1937 and July 1938 emphasized the need of separate teachers for separate subjects and of improvements in other directions in several medical schools. The recognition was extended by two years and in two cases by one year within which they were required to remove the defects.

6. A standard form of inspection of medical schools and hospitals where the students received their training was adopted by the Council by a resolution in July 1938, with a view to securing uniformity and also in order to indicate to the institutions what requirements they are to fulfil.

7. At their meetings of January 1938 the Council expressed their grave anxiety regarding the financial position, and adopted resolutions that the grant from Government should be increased. The ordinary half-yearly meeting due in July 1937 had to be stopped for want of funds.

8. The Council at their meeting of July 1936 adopted a resolution that representatives from them should inspect the licentiateship examinations held by the State Medical Faculty.

ABSTRACT OF THE PROCEEDINGS OF ASSAM MEDICAL COUNCIL

THE ordinary general meeting of the Assam Medical Council was held at Shillong at 10-30 a.m. on Thursday, the 8th October, 1936,* in the office of the Inspector-General of Civil Hospitals, Assam, Shillong.

Proceedings

Resolved that the Calcutta University be approached with a view to ascertaining on what terms and conditions they would be prepared to reopen the admission of selected L. M. Ps. for degree qualifications by examination.

Resolved that in the interests of efficiency opportunities be given to all compounders serving in Government, local and municipal boards other than those serving in the headquarters hospitals to attend periodical refresher courses in district headquarters hospitals.

Resolved that a strong recommendation be made to all appointing authorities that in future no individual should be appointed as a compounder unless he is in possession of a recognized compounder's certificate.

Resolved that, while appreciating the desirability of extending the curriculum of the Berry-White Medical School from four to five years, this council realized that this cannot be done until the present four years' curriculum is brought up to a proper standard.

Resolved that the principle of registration of compounders be approved and the question now be taken up with the Government of Assam and with the governments of other provinces.

Resolved that the following reply be sent to the Secretary, Medical Council of India:—

(*i*) In the opinion of this Council Indian Nationals who have obtained Medical Degrees of repute in foreign countries with which there is no reciprocity should be granted recognition of these Degrees in India.

The definition of 'Degrees of repute' should be determined by the Indian Medical Council and communicated to Registrars of the Provincial Medical Councils.

(*ii*) The Council is of opinion that Nationals of foreign countries with which there is no reciprocity should not be recognized when they come to India until such time as reciprocity is established.

* Report received 11th July, 1938.

THE OPERATIONS IN WAZIRISTAN

AMONG honours conferred for services rendered in connection with the operations in Waziristan from September to December last year are the following:—

C.B.E. (*Military*).—Colonel R. E. U. Newman, O.B.E., M.C., M.B. (Edin.), R.A.M.C. (now retired).

D.S.O.—Lieutenant-Colonel Stanley Arnott, M.D. (Edin.), R.A.M.C.

M.B.E. (*Military*).—Captain V. M. Albuquerque, F.R.C.S. (Eng.), I.M.S.

Military Medal.—Lieutenant (late assistant surgeon) M. C. Condillac, M.R.C.S. (Eng.), Auxiliary Force Medical Corps, India.

Current Topics

120 Cases of Tuberculosis in Children at Batavia in 1935 and 1936*

By J. H. DE HAAS
TE BEK SIANG
and
INJO BENG LIONG
(*From the Children's Department of the Central Civil Hospital and Medical College at Batavia*)

(An English Translation from *Geneesk. Tijdschr. Nederl.-Indië*, Vol. LXXVII, p. 2945)

'VERY little is known regarding tuberculous infection and disease in infancy and childhood in India' (Ukil, 1937).

When, scarcely a decade ago, pediatrics in this country developed into an independent branch of medicine, it still was governed by prejudice to an extent that exceeded its dependence upon objective research. One of the stories kept current—for reasons more readily to be understood a little further on—was to the effect that tuberculosis amongst children in this country did not occur at all, or at any rate very rarely.

After a previous effort made in this direction, it is now possible finally to dispose of this notion on the strength of investigations based upon actual observation.

In 1933 an article was published dealing with 26 cases of tuberculosis in Chinese children that a year previously had been admitted into this department (de Haas,

* A paper read at Samarang before the Second Netherlands Indian Tuberculosis Congress, on 31st July, 1937; rendered into English by E. E. Power.

[This translation was accepted for publication in the Special Tuberculosis number, but had to be held over on account of shortage of space.—EDITOR, *I. M. G.*]

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1933), in which connection the supposition was advanced—contrary to the conceptions that generally prevailed at the time—that a *systematic* investigation would readily prove that also amongst native children tuberculosis was not by any means rare; since which period there have been a few communications in the Netherlands Indies on tuberculosis in infants and children.

In addition to the demonstrations at various meetings, of children suffering from tuberculosis, as, for example, by Liem Ghik Djiang (1936) and Van Joost (1936) at Malang, by Luyke Roskott at Sourabaya (1936), Miss Bonnet at Samarang (1936), and also of children from our Batavia Clinic (de Haas, 1936, 1937; Injo Beng Liong, 1936; Te Bek Siang, 1937) more specific reference must be made to the data on tuberculosis in children in the papers read by Müller of Sourabaya (1936) and Reddingius of Batavia (1936) at the preceding Tuberculosis Day.

Between 1930 and 1936 there were brought in for post-mortem examination at Sourabaya 199 children between the ages of six months and 16 years, 25 or 12½ per cent of whom had died of tuberculosis, a mortality figure that will prove to be the same as that prevailing amongst the children in our Batavia hospital.

In the course of eight years (1928 to 1936) Reddingius observed in the Surgical Clinic at Batavia spondylitis in 33 children below the age of 15, and coxitis tuberculosa in 29 such children; that is to say, an annual average of eight cases of bone tuberculosis in children that previously must have had a primary affection.

The clinical observations made in our children's department these past several years, and the tuberculin survey amongst school-going children at Batavia published last year (Injo Beng Liong and de Haas, 1936) caused us to anticipate that tuberculosis in children could not be very rare in this country. This actually had already been determined *a priori* by the fact that pulmonary tuberculosis in adults here is quite frequent, and analogous to conditions in Europe at a former period; there is bound to be also in the tropics a considerable frequency of tuberculosis in children, in interaction with food, housing, and other social conditions.

This is borne out by the data in the subjoined table. This table contains only those cases of tuberculosis in children of which the diagnosis had been definitely determined after clinical observation. If there remained any doubt at the time that the case records were subjected to a further scrutiny, the case in point was not included amongst these observations, even though previously the diagnosis had been tuberculosis. Thus it was that the 120 cases, now to be discussed, represent the minimum number of cases which during 1935 and 1936 were given clinical treatment in our department. Actually the number undoubtedly was greater, seeing that also cases of tuberculosis must have occurred amongst the more or less doubtful instances.

In addition it occurs constantly in our department that children are admitted that die within a few hours, in which cases, provided no *post mortem* takes place, it is sometimes impossible to establish a diagnosis. Amongst these there undoubtedly also will be children with tuberculosis, as was obvious from the autopsies performed in several instances.

Furthermore the already considerable number obtained would have been still larger if it were not that pulmonary tuberculosis in children is difficult to recognize by the family physician: the stages leading from infection to illness are so broad and are marked by such very gradual transitions that the disease, indicated by symptoms that are anything but definite, in many instances is difficult to be determined, always provided that tuberculin reactions are not being made systematically. Thus it is a very rare occurrence that a child is referred to our department by the family doctor after his having diagnosed tuberculosis.

Last, but not the least, the significance of the number indicated must also be viewed in the light of the fact—already pointed out (de Haas, 1933)—that bovine tuberculosis is practically unknown here amongst human beings; at any rate, it has not as yet been found to occur. This could not very well be otherwise amongst a population not drinking any milk, and therefore *a fortiori* any unboiled milk; and to this must still be added that it is the opinion of veterinarians here that tuberculosis of cattle in this country is of rare occurrence (Lobel *et al.*, 1936).

These same investigators, however, found human strains in pigs. They pointed out with justice that most likely these pigs had been infected through human beings, but that in their turn they again would be likely to spread human tubercle bacilli; that is to say, they would be dangerous to human beings.

As regards England and Scotland Griffith (1931) and Griffith and Smith (1935) give bovine infection in children as amounting to 17 per cent, and for the Province of Zuid-Holland Boer (1933) found 25 per cent (15 cases out of 65). Boer (1936) in Zuid-Holland found amongst adults 3 per cent of bovine infections.

It is hardly possible to represent schematically the method according to which our diagnosis was determined. The tuberculin reaction—no tuberculosis in children without a positive tuberculin reaction—was taken as its basis, to be amplified by clinical observation, roentgen photographs, bacteriological cultures and animal tests of the gastric juice or other material, and where possible also *post-mortem* particulars. With reference thereto the bacteriological examination exercises an ever-increasing importance, whilst it is impossible to pursue the course of a tuberculous pulmonary process in children without repeatedly making roentgen photographs.

Through these modern methods of research the study of tuberculosis in children for several years past has developed so rapidly, whilst the notions connected therewith have undergone such swift changes, that as yet it is impossible to contemplate the results objectively, the more so since the process referred to is still in course of rapid development.

Thus it is not likely to have been a mere coincidence that Huet, the Netherlands physician with the greatest experience with reference to tuberculosis in children, transmitted his study on the clinical course and the treatment of pulmonary tuberculosis in children (Huet, 1932) to a younger colleague with the admonition: 'Be careful about accepting what is contained herein'; a symptom of modesty that indicates an amount of experience which, in addition to caution, more specifically inspires respect.

It is self-evident, however, that one of the first surveys concerning tuberculosis in children in the Netherlands Indies will have to be envisaged upon the basis of the above-quoted saying, whilst also the data having reference thereto, the most important of which have been comprised within the subjoined table, may prove to be not altogether devoid of significance.

This table permits of the following conclusions being drawn:—

1. Of the 120 tuberculous children observed, 30 were infants less than one year of age.
2. Both in infants and in children above one year of age the fatality rate is not less than about 40 per cent.
3. Of the infants admitted in the course of these two years approximately 2½ per cent suffered from tuberculosis.
4. Of the children above one year of age admitted within these two years 7 per cent suffered from tuberculosis.
5. Of the infants that died in our department in the course of this period 3 per cent died of tuberculosis.
6. Of the children above one year of age no less than 13 per cent died of tuberculosis; this being a striking correspondence in mortality with the above-mentioned *post-mortem* rate of 12½ per cent, published by Müller of Sourabaya.

The fatality rate can be unfavourably effected through only serious cases having been sent for treatment, though this is hardly likely to have been the case with reference to infants, seeing that of 48 infants

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TABLE

Age and racial classification in 120 cases of tuberculosis in children at Batavia in 1935 and 1936

Classification	Infants		Children		Total		Morbidity, percentage (*a*)		Mortality, percentage (*b*)	
	Total	+	Total	+	Total	+	Infants	Children	Infants	Children
Chinese ..	16	9	47	23	63	32	3.3	9.3	3.8	17.0
Native ..	14	6	39	10	53	16	2.4	6.4	2.7	8.2
European ..	0	0	4	2	4	2	..	..	..	..
Total percentage	30	15	90 (*c*)	35 (*d*)	120	50 (*e*)	2.6 ± 0.5	7 ± 0.7	3 ± 0.75	13 ± 2.1
Fatality ..	50 ± 9.1		39 ± 5.1		42 ± 4.5					

(*a*) With reference to the total number of children admitted to the department during 1935–36.
(*b*) With reference to the total number of deaths in the department during 1935–36.
(*c*) Of which 67 were children between the ages of one and four years.
(*d*) Of which 25 were children between the ages of one and four years.
(*e*) Not including three children taken away in dying condition by their parents.

with tuberculosis that were admitted to the Amsterdam Children's Clinic between 1928 and 1934 (and with reference to which it is very likely that the diagnosis could have been formulated earlier), also one-half died (De Lange and De Bruin, 1935).

But even if it were true that the number of children sent for treatment to our department, and that die there, would hardly represent proportionately the amount of children's disease and child mortality within this city, at any rate, it cannot be denied that the picture presented by our department in this respect leaves an approximate impression of the suffering of infants and children in the native and Chinese quarters of Batavia.

Subject to the above-mentioned restriction this would signify that of the approximately 5,000 infants less than one year of age that annually die in Batavia (de Haas, 1936) 150 succumb to tuberculosis; whilst of the approximately 2,500 children over one year of age that annually die in our capital, fully 300 will have died of tuberculosis.

According to this estimate, which actually is far less unsupported by evidence than one would like to believe, about 500 children annually die of tuberculosis in Batavia, whilst at a fatality rate of 40 per cent. 1,000 to 1,500 children would be suffering from tuberculosis as a disease. Once again it must be pointed out with emphasis that the figures here adduced do not pretend to represent the exact frequency. If the fatality rate within the city is less, because it is possible that in our department the relatively severer cases are submitted for treatment, then the total number of children suffering from tuberculosis will be still greater than the figure here calculated.

Even those to whom the affliction of parents and of children at Batavia remains *terra incognita* will hardly fail to realize that tuberculosis in children here, far from being rare, is particularly frequent, both amongst the native and the Chinese population, even though the figures given are only approximately correct, and even though it be fully realized that the havoc wrought by tuberculosis amongst children here represents but a minor part of the high mortality amongst infants and children, principally determined by entirely different factors.

In 27 out of the 120 cases observed the contact person could be indicated, whilst in practically all instances there must have been infection through a person with open phthisis. Blacklock (1932) some years ago pointed out how difficult it was in Europe to discover such contact persons. It need hardly be emphasized that in the more primitive tropics such difficulties are still greater, in fact insurmountable sometimes.

It is probable that some improvement can be made in this respect by systematic house visiting, whilst on the other hand again, through the systematic tuberculin survey and general examination of children in whose surroundings a tuberculous adult has been discovered, the early infection of children can readily be established.

Upon admission to our department, it is true, the tuberculin reaction is systematically applied, but in 18 out of the 120 cases this could not be done because of the death of the child ensuing within a few days after its having been admitted. Of the 102 von Pirquet reactions applied, 75 were found to be positive, 73 ± 4.4 per cent. Von Pirquet (1907) himself already knew that children with a serious form of tuberculosis may exhibit a negative cutaneous reaction.

From the end of 1935 onward it became customary with us to apply, besides the von Pirquet reaction, also that of Mantoux, usually in a 1 in 5,000 dilution, but also sometimes, if previously tuberculosis diagnosis was considered to be likely, with a 1 in 100,000 dilution, so as to prevent a too severe reaction. In this way the Mantoux reaction was applied to 67 out of 120 tuberculous children: of these 49 (73 per cent) reacted positively, which is approximately as many as reacted in this way upon the application of the von Pirquet reaction.

In 14 negative cases upon applying Mantoux (1 : 5,000) the tuberculin reaction could be repeated after three or four days with Mantoux (1 : 100), whilst in two instances Mantoux (1 : 100) was applied immediately. In 13 of these cases the reaction resulted positively.

Thus with the Mantoux reaction in 69 children the total positive cases in tuberculosis was 62 = 90 ± 3.6 per cent. A negative Mantoux reaction occurred only in succumbing (cachectic) conditions, one or two weeks prior to the child's demise. The difference with the von Pirquet reaction, which provided a percentage of positive cases amounting to 73 ± 4.4 per cent, is devoid of statistical significance, and would probably have been smaller had the von Pirquet reaction been repeated.

The negative tuberculin reactions, sometimes even where Mantoux (1 : 100) was applied, in some children with tuberculosis shortly before their demise, are apparently opposed to the rule above laid down: no tuberculosis in infants or children without a positive

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tuberculin reaction. But in the nature of things this rule applies to children that are ill, and not to such as are already dying. Even in children that are on the point of succumbing to tuberculosis a negative Mantoux reaction is rare.

Only in 12 out of the 120 children no active pulmonary divergences were found, but the symptoms indicated spondylitis 3, coxitis 2, lymphomata 3, tuberculosis of the kidney 2, and scrofula 1. Practically all (108 children), therefore, suffered from pulmonary tuberculosis with or without its relative complications.

This short synopsis does not allow of a detailed discussion of the nature of the pulmonary divergences that were observed in connection with these children. Their differentiation, with reference to which the physical examination plays but a minor part—and it is this which enables us to understand why formerly it was believed that tuberculosis in infants and children was but a rare occurrence in this country—even with roentgen control is so difficult that it is impossible to sketch in brief these difficulties which even at the dissection table may still present themselves. Definite correspondence of clinical with roentgenological, and of roentgenological with *post-mortem* results, is quite rare.

Here it is simply pointed out that in 67 out of the 120 children pulmonary infiltrations were observed roentgenologically, nine of these were combined with pleuritis. Of the five primary complexes three were found upon *post-mortem* examination. The so-called pulmonary hilus divergences represent those roentgenological phenomena that are most difficult to interpret. Less hesitation is sometimes shown in diagnosing swollen tracheo-bronchial glands.

Of the 50 that died, 36 children died of meningitis and/or miliary tuberculosis, and 14 of other tuberculous deviations. Of these latter, four children had a generalized tuberculosis (two with tuberculosis of the brain, without meningitis), eight a progressive pulmonary tuberculosis with or without cavitation, whilst in the case of one child that had succumbed, the tuberculosis had been complicated by paratyphoid A, and in another by bacillary dysentery.

All these forms of tuberculosis in children and infants occurred both amongst native and Chinese children, they having been described already in the latter in 1933. The surmise then expressed, to the effect that native children in Batavia, after their infection with tubercle bacilli, could pass through the *identical* forms of tuberculosis and were threatened with the *identical* complications (tuberculous meningitis, general dissemination, infiltration, cavitation, etc.) as were children in Europe, is now being confirmed most convincingly.

The considerable frequency of miliary disseminations represents the most striking proof thereof. Thus amongst the 53 native children, tuberculous meningitis was observed in nine instances, amongst the 63 Chinese in 19 instances, and amongst the four European children in two instances; that is to say, in no less than 30 cases (12 of which were infants) of tuberculous meningitis in a total of 120.

In nine of these 30 children with meningitis a general miliary tuberculosis was found to exist, whilst in the case of nine other children a miliary dissemination was diagnosed (roentgenologically or *post mortem*) without meningitis accompanying it.

Seeing that only three out of the 16 native children, and only 12 out of the 32 Chinese children that had died could be subjected to a *post-mortem* examination—this small number of autopsies represents a very serious hiatus in this investigation—it is quite possible that cases of miliary tuberculosis without meningitis were not recognized as such, because even in the roentgen photograph the miliary dissemination may be difficult of interpretation.

The number of cases of meningitis (30) and of miliary dissemination without meningitis (9) together, therefore, amount to at least 39, or three-fourths of the 50 deceased, and this does not include three children with meningitis or with miliary tuberculosis that were removed in dying condition by their families.

As is the case in Europe, and therefore also amongst native and Chinese children, miliary dissemination and meningitis represent the complications most to be feared in pulmonary tuberculosis, and this the more so as the child is younger. Wallgren (1935) has very correctly pointed out that the treatment of tuberculosis in infants and children must mainly be directed, therefore, to the prevention of miliary dissemination, and that this can be attained by means of prolonged rest under adequate hygienic conditions.

For the Netherlands Indies this signifies (in so far as this need still be argued after what has been said above with reference to the frequent occurrence of tuberculosis in children) that here also children's sanatoria, where the little patients in the first instance must be regarded as children and not as pocket editions of adult tuberculous patients, are indispensable if in the treatment of tuberculosis in children one does not wish to fall back upon an amateurishness that is as costly as it is harmful. It may be pointed out with considerable satisfaction that in the course of the current year the first children's sanatorium is being opened in the Netherlands Indies at Batoe in East Java. It is to be hoped that it can be managed on a pediatric basis, and that this laudable example may soon find emulation.

In combating tuberculosis in children any sanatorium, to be established in the Netherlands Indies, can but play a minor part, for the main point in this connection is the improvement in social and hygienic conditions, a proposition which Dinger (1936) has maintained also with reference to the campaign against tuberculosis amongst adults in this country and which, on the basis of very wide European experience, cannot possibly be contradicted. As Varrier Jones (1937) put it: 'The result would be cheaper than hospitalization, in cash and moral'.

Together with this, however, the significance of the isolation of adults with open tuberculosis—the source of infection of children—must not be underestimated.

Some years ago it would appear as if not only adult sufferers from open tuberculosis represented a source of infection for children, but also that children could easily infect each other. Armand Delille and Vibert in 1927 re-called that as early as in 1898 Meunier had already proven the existence of tubercle bacilli in the stomach contents, removed before food had been taken, of children that had swallowed the coughed-up mucus.

This method, practically forgotten, not only proved to be a very satisfactory one, but at the same time caused the problem of so-called open tuberculosis in children to assume within a very short space of time an entirely different aspect (whilst also in the case of adults it becomes of even greater significance). A summary of the literature thereon was published by de Haas (1932), in the course of which it was explained why, though it may not be neglected, the mutual infection of young children need not be given too wide a significance.

Since then this method has been applied regularly in our department, in the manner indicated by Jensen (Poulsen, 1932), to children with a positive tuberculin reaction, even though clinically and/or roentgenologically no divergences were found. The bacteriological examination—culture or animal test—was performed in the medical laboratory at Batavia.

In 88 out of the 120 children the gastric juice could be examined in this manner. The culture and/or animal test in the case of no less than 50 children was found to be positive: a result which sufficiently indicates the significance of the bacteriological examination also in the tropics, without it being necessary to enter more deeply into the subject.

It is nevertheless probable that the number of positive bacteriological examinations could have been still greater, in view of the fact that in some instances where there were extensive pulmonary divergences, though the tuberculin reaction was positive, the bacteriological outcome proved to be negative.

With this the bacteriological examination of the spinal fluid turned out positive 22, of which 18 with

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gastric juice that was negative or had been left unexamined. In addition in the case of seven children tubercle bacilli were found in other material bacteriologically examined (urine 3, pus from *lymphomas* 3, a streak preparation from an ulcer of the cornea 1) of which four had negative or untested gastric juice.

All in all, therefore, in $50 + 18 + 4 = 72$ out of the 120 children tubercle bacilli, in every instance of human origin, were found to be present in one of the body fluids indicated.

To the two common children's diseases of which the diagnosis has long since been based upon bacteriological examination, *i.e.*, typhoid and bacillary dysentery, a third has been added in recent years, namely, tuberculosis. The significance of bacteriology in pediatrics in the tropics, where these three diseases are of daily occurrence, can hardly be exaggerated, quite apart from the indispensable assistance which is afforded by the bacteriological examination in specific infections, and by accidental affections that are of less frequent occurrence.

The support of other so-called accessory sciences is of no less importance, whilst epidemiological orientation has become indispensable. If, therefore, one desires to obtain a correct insight into the considerable significance of tuberculosis in infants and children in these countries, instead of relying too greatly upon mere impressions, then it will be necessary that, side by side with the physical and pathological anatomical examination, the study of tuberculosis in infants and children must become based upon a *systematic* tuberculin examination, a *systematic* roentgenological examination, and a *systematic* bacteriological examination.

This research was carried out with the aid of the Queen Wilhelmina Jubileum Foundation at Batavia.

Summary

1. In the children's department of the Central Civil Hospital and Medical College at Batavia there have been observed, in the course of the two years 1935 and 1936, at least 120 cases of tuberculosis in 53 native, 63 Chinese, and four European children.

2. Of the 120 cases one-quarter were infants and three-quarters were children over one year of age.

The fatality rate averaged about 40 per cent. The hospital morbidity in infants and older children was 2.6 per cent and 7 per cent, respectively, with reference to the total number of patients admitted, whilst the mortality was 3 per cent and 13 per cent, respectively, with reference to the total number of deaths in the hospital.

3. In Batavia, and probably also in the whole of the Netherlands Indies, tuberculosis frequently occurs amongst native and Chinese children, and must be regarded as a serious disease.

In spite of opinions to the contrary, previously expressed, the undeniable relation existing between tuberculosis in adults and in children appears to hold good also for the Netherlands Indies, as was to be expected.

4. The native and Chinese children in Batavia, after having been infected with tubercle bacilli, pass through the identical forms of tuberculosis and are subject to the same complications as are children in Europe similarly affected.

In addition to sanatoria for adults, and not merely as an annex thereto, children's sanatoria should be established on a pediatric basis in the Netherlands Indies.

5. The diagnosis of child tuberculosis in this country is based upon the tuberculin test, there being no child tuberculosis without a positive tuberculin reaction.

The few negative tuberculin reactions in children with tuberculosis just prior to their demise do not constitute actual exceptions to this rule.

6. In the case of 102 children the von Pirquet reaction was applied (without being repeated) and was found to be positive in 75 cases, or 73 ± 4.4 per cent.

In the case of 69 children the Mantoux reaction was applied (1/100 after 1/5,000); this proved to be positive in 64 cases, or 92 ± 3.3 per cent.

7. Of the 120 children 12 were without active pulmonary process (3 spondylitis, 2 coxitis, 3 lymphomata, 1 tuberculosis of the kidney, and 3 scrofula).

8. In the case of 16 out of the 120 children miliary tuberculosis was diagnosed, seven without meningitis. The total number of meningitis cases was 30 in 50 of those diseased.

Also here miliary diffusion, with or without meningitis, is the complication most to be feared (39 cases out of 50 deaths) in connection with child tuberculosis.

9. In 88 cases the gastric juice was bacteriologically examined, and in 50 instances tubercle bacilli were found.

10. Of the 22 children with tubercle bacilli in the spinal fluid there were 18 whose gastric juice either had been negative or had not been examined.

From other material (pus, urine, etc.) tubercle bacilli were cultivated seven times, out of which the gastric juice had been found to be negative or had not been examined four times.

In the case of 72 out of the 120 children, therefore, the diagnosis of tuberculosis was confirmed bacteriologically (animal and culture experiments in the Central Medical Laboratory at Batavia).

11. In addition to the physical and the pathological examination, in the tropics the study of tuberculosis in children should be based upon a *systematic* tuberculin examination, a *systematic* roentgenological examination, and a *systematic* bacteriological examination.

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The Control of Tuberculosis in the Tropics

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(Abstracted from the *Tropical Diseases Bulletin*, Vol. XXXIV, No. 11, November 1937, p. 819)

IN dealing with the control of tuberculosis in the tropics we have to visualize a variety of situations, methods that would be of avail in an urbanized or semi-urbanized community composed of races partly immunized by centuries of exposure, would prove worse than useless in a primitive community in whose midst the disease is beginning to make headway. Further, any methods of prevention must be outlined in relation to the existence of other preventable disease, the tropical sanitarian is beset with so many problems in respect to the prevention of disease that the addition of yet another bids fair to be the straw that broke the camel's back. However, the basis of anti-tuberculosis measures differs in no respect from that for other diseases, namely, good housing, correct feeding and sound sanitation. As Crocket puts it, tuberculosis is an index disease pointing to the conditions of life and work prevailing in any region. When the death rate for tuberculosis is falling it is proof that sanitation is receiving efficient attention on the part of the responsible authority.

There are some workers who would leave the matter in the hands of the sanitarians, as they are convinced that essential sanitary reforms, even in the absence of specific measures, will suffice to eradicate the malady in time. Winchester draws attention to the fact that the tuberculosis death rate in the Straits Settlements has steadily diminished since the early years of this century, moreover its decline has been steeper than that of the general death rate. The fall has been most marked in Singapore Island where the percentage of people living under rural conditions is low. He maintains that any anti-tuberculosis measures apart from housing and town planning schemes are of little avail. The process of urbanization will, he thinks, solve the problem by allowing a more complete infection of all the population and thus hasten the elimination of the weakly-immune. As it has taken the Jews two thousand years to attain this stage it would appear desirable, at least, to attempt to reach it somewhat earlier.

Control of bovine tuberculosis in the tropics

Before considering the human aspect of the problem it is necessary to mention the need for veterinary prophylaxis. In many colonies, particularly in Africa, a strict watch is being maintained on the incidence of tuberculosis in cattle. That this is essential is shown by the comparatively high rate of infection amongst the cattle in British Guiana; the disease has now been allowed to spread to such an extent that eradication by slaughtering will be an expensive measure. Consistent and wide scale tuberculin testing, even though it may appear expensive, will pay in the end if it eliminates the few infected beasts before the disease commences to spread. Nor should the thorough testing of imported cattle be omitted, since importation of bulls from the United Kingdom is often carried out in order to improve the local breeds. Even where milk is not an article of diet the persistent propaganda of health departments that milk is the perfect food is introducing the milk drinking habit, and to replace malnutrition by bovine tubercle will not reflect credit on any propagandist. The time is ripe for more attention to be paid to this question, lest it produces another problem for the tropical hygienist.

Control of tuberculosis in backward communities

Communities are still to be found where ignorance and prejudice prevail to such an extent that any measure of control appears almost impossible of application. The first point to consider is whether tuberculosis exists to any great extent in such a community. The hospital records are not always to be depended upon to furnish very accurate returns; in the first place, the rapidly fatal case common in primitive communities never enters hospital; secondly, with a busy out-patient department and crowded wards differential diagnosis is not easy and the diagnosis of bronchitis not infrequently conceals the damage which should be laid to the credit of tuberculosis. The only certain methods of ascertaining, with some degree of accuracy, the amount of tuberculosis present are the tuberculin test and post mortems. Local prejudice is less easy of solution, but as long as schools, police forces and jails exist, material will be found for investigation. Where an aversion to the introduction of medicines under the skin is met with, Craig's test is especially useful, as the extra O. T. is wiped off and the puncture does not appear to the untrained observer to introduce the material into the body. Actually, in most parts of the tropics, injections are largely demanded by the inhabitants who see in this method of administering medicaments a great improvement on

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the old-fashioned way of merely swallowing them, so that intradermal tests should not arouse any great antipathy.

The acquisition of information through the medium of post mortems is sadly hampered in many parts, especially where the population is of the Mohammedan faith. Routine autopsies are out of the question, but the keen medical officer will always be on the look out for opportunities furnished by post mortems required to be done in the interests of the law. The records of these can furnish a good deal of information if they are performed with an eye to general interest as well as to the ascertainment of the actual cause of death. Again, a considerable amount of information may be acquired by the use of the *x*-ray. It is true there are still areas where no *x*-ray apparatus is available, but these are becoming fewer in number, and time spent on carrying out as large a series of screenings as possible would yield a great deal of valuable information. The correct assessment of the presence or absence of thoracic disease requires practice but experience soon brings a reasonably high standard of proficiency. Nowadays, there are screens on the market which give as clear a picture as one could possibly desire.

Once information has been acquired regarding the amount and type of tuberculosis present measures have to be considered in relation to the control of the disease if it is, or threatens to be, a public health problem of any magnitude. In work of this nature there is only one royal road to success and that is concentration on the family as a unit, not on the infected individual alone.

This is especially necessary in communities where the people live in rural or semi-rural conditions. As soon as an open case is detected, every effort should be made to carry out as efficient isolation as may be obtained. Conditions vary so much that it would be foolish to lay down any specified methods, there are places where the disease is regarded with so much horror that the unfortunate sufferer is practically left to care for himself; elsewhere no notice is taken of the condition and the whole family is exposed to intense infection. As far as possible two measures should be enforced, namely, the cleanly disposal of sputum and the placing of the patient in the open air for as many hours of the day as possible, but guarded from the direct rays of the sun. In some cases an ordinary calabash filled with wood ash forms an excellent receptacle for sputum or an issue of old tins containing a small amount of liquid disinfectant will suffice. Where feasible the contacts should be tuberculin tested and screened and the regular issue of a little medicine, especially cod-liver oil, to the children, often suffices to ensure their regular attendance at a hospital out-patient department for a considerable period, thus enabling them to be kept under observation.

In a community such as outlined here, the tuberculosis dispensary can serve no good purpose, its place as a clearing centre can be filled to better purpose by the district hospital. To set up a dispensary before its proper function is appreciated by the population it is intended to serve would merely be a waste of time and money. It resolves itself into keeping up another out-patient department, as those with all and every ailment would go to it for treatment. Once simple anti-tuberculosis measures are set going over a wide area and the inhabitants begin to appreciate their significance then the time is ripe for the first step in organized work, the erection of the tuberculosis dispensary. Nor does this entail considerable expense: the erection of a simple structure with room for expansion is much more desirable than the usual type where limited waiting accommodation aids the spread of infection; here patients, healthy adults and children may have to crowd in together and the dispensary unwittingly becomes the centre for further dissemination of infection. The best type of building is that built well off the ground so that shelter from rain or sun may be obtained under the structure with no restriction on ventilation. It should be in a central position, easy of access, though not on too commanding a site in order to avoid attracting undesirable publicity. On the other hand, to site such a dispensary in some remote corner on the farther edge of town or village, encourages people to be secretive, and the idea that tuberculosis is something to be ashamed of gains ground.

In the early stages any attempt at introducing treatment requiring regular attendance is likely to meet with failure; the unsophisticated native is at a loss to understand either the nature of the treatment or the need for its repetition. A judicious selection of cases with minimal progressive lesions for treatment by phrenic evulsion is recommended, it only requires a few successes to induce others to come forward. Even in these more backward communities there is always one section that will respond to intelligent propaganda and seek treatment, namely, the clerical and administrative subordinate staff and school teachers. If a start can be made by detecting early cases amongst this class and active collapse instituted, the results will attract widespread attention. Patients drawn from this class ensure better results, they are capable of understanding the principles of treatment and their circumstances are such as to permit of rest for a prolonged period and a reasonable standard of nourishment. Such cases amply repay the trouble and care expended on them if they are carefully selected and their progress attentively watched. One demonstration of the efficacy of artificial pneumothorax is worth a score of hygiene talks. Hitherto, in many parts even amongst the educated natives, their attitude has been that tuberculosis is one hundred per cent fatal and while they may seek advice it is only in the last stages when despair drives them to try medicines, in which they have no real faith. The infiltration of the news amongst the better educated portions of the populace soon extends even to the most ignorant.

Once the desire for treatment is aroused in the minds of the people the question is how to carry out such treatment in circumstances that will make the patient feel at ease and yet will enable the medical man to administer it under optimum conditions. The answer appears to be the setting up of small communities where sufferers may live under conditions resembling their habitual environment and yet permitting of reasonable isolation and continued attention. Cummins describes the work of Swiss missionaries in Portuguese East Africa who have developed a 'tuberculosis village' in which the patients are cared for and fed by their own relatives, and yet treated and supervised by medical men who understand them and can fathom their prejudices and anxieties, instilling confidence in them by this appreciation of their mental processes. The huts are inexpensive to construct, and when vacated on account of death or removal can be burnt down.

Stones, discussing the problem of tuberculosis in Uganda, suggests that sanatorium treatment will not suit African needs, but village settlements appear to be the solution. The patient, once treatment is successfully under way, could carry on trades as is done in settlements at home, especially such employment as is suited to his needs and training. He quotes the suitability of experimental small-holding schemes of the Uganda Department of Agriculture for such settlements. He puts the matter very aptly when he says 'segregation with contentment should be our watchword'. The excellent work done by missions in connection with the maintenance and treatment of lepers might well be extended to village settlements for the tuberculous.

The above measures, elementary though they appear, if energetically carried out should have a decisive effect in checking the extension of the active disease. In no part of the world, save, perhaps, amongst a few primitive hill tribes or remote jungle dwellers, will tuberculosis ever sweep through the community as it did among the North American Indians; infection is now too general. Kleine commenting on anti-tuberculosis work carried on in Africa, with especial

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...Wilcocks, asserts that any fear of ... assuming epidemic proportions, even in ...sions of East Africa, is groundless. The ...gradual infection of whole populations that is ...aking place is a sufficient guarantee against the repetition of the disasters seen in the past.

Control of tuberculosis in developing communities

As these communities develop and present possibilities of gain to the pioneers of commerce and industry, the problems of defence against tuberculosis become more difficult. One of the most important sources of infection from outside is the entrance of the petty trader, so often one of the oriental races, who carries with him the organisms of disease readily enough but fails to bestow along with these unwelcome gifts those elements necessary for rapid and effective immunization. This invasion, mainly by Indian and Arab traders, is general throughout Africa. Rodhain was of the opinion that the disease was spread in Belgian Congo by Arabs and Baluchi traders as well as by Europeans. Elsewhere the same process has been observed. The writer has had clear evidence of the spread of tuberculosis through an area in British North Borneo, densely populated by a primitive tribe, following the setting up of shops by Chinese traders. In areas where traders are already established in large numbers little can be done in the way of special prevention by forbidding their entry, but in sheltered communities any infiltration by such traders ought to be more strictly controlled by the medical department.

The part that should be played by Government control during this evolutionary process is admirably set out by Young who, as the result of his experience in West Africa, affirms the theory that equality cannot be present as between immune and non-immune peoples. This lack of resistance clearly renders rapid urbanization a most undesirable process for native races. Young would reverse the usual process of bringing the native to the city by erecting townships in outlying districts. In planning for these, the density of the population would be limited by restricting the number of buildings to be erected on any given area. Moreover, he would place upon industry the burden of housing its workers in decent manner. These two measures would lead to the setting up of small townships extending out into the bush instead of becoming grossly overcrowded at the centre. No industrial concern would be allowed to commence operations until it owned, or obtained an option on, land in its immediate vicinity to supply sufficient accommodation for houses for all its workers and their families. This measure would prevent the setting up of new works in the heart of an already overcrowded town and the enticement of rural dwellers to flock to the town and enter the unhealthy environment associated with urban employment. If groups of industries were established along these lines small townships, limited in size, could be set up which would be sufficiently near the agricultural areas to enable workers to obtain their natural foodstuffs cheaply and further would not estrange them entirely from their old methods of living.

It is in these gradually evolving communities that survey methods are so necessary; by tuberculin test and fluoroscopy it should be possible to watch the progress of infection and to circumscribe the more dangerous foci of disease. The establishment of a tuberculosis dispensary would be a measure of great practical value; the community has now outgrown the limited resources of the district hospital and its individual members have attained the stage where they may be expected to make intelligent use of such a centre. Along with the erection of a dispensary there arises the problem of providing a specialized medical staff. Once again we are faced with the question of the relative importance of tuberculosis compared with other diseases and the necessity for deciding whether the additional expense of the appointment of a phthisiologist is justified. In the more backward communities the best person to handle the problem is the district medical officer; he has a sound all-round knowledge and if necessary should be encouraged to take study leave to make himself *au fait* with the more technical aspects of tuberculosis treatment. In communities where development is proceeding, the health officer, in co-operation with the staff of the district hospital, should be made responsible for anti-tuberculosis measures. One cannot recommend the appointment of specialist officers at this stage; the extra expense is not justifiable; further, most tropical countries have in their service men with post-graduate experience of tuberculosis work. An experienced officer of this kind could be seconded for a time to formulate a plan of campaign and to assist in dealing with special aspects of the task.

There is also the question of a subordinate staff and the problem of obtaining an efficient personnel for such a staff from among the local inhabitants. To expect to be able to produce a highly trained and certificated staff from a community slowly evolving out of a primitive state would be foolish. On the other hand, to import such a staff from Europe would be beyond the means of most communities if it were to be devoted entirely to tuberculosis work. It is not necessary to demand a high standard of training for such health visitors; in the first place, a course of training in the local hospital of sufficient duration to enable them to understand the elementary facts about the treatment and prevention of disease should be arranged. To undergo this training women should be selected who have had a reasonable degree of education, and are possessed of common sense and a good moral standard. The mission or religious body that cannot produce such women nowadays from amongst its adherents is rare indeed. They need not be capable of solving difficult nursing problems, but they must be able to do hard work, face rebuffs with quiet patience and show a quick sympathy and understanding and unquestioned loyalty. Given these qualities the development of such a woman, of whatever race, into a first-class social worker is a matter of time and largely dependent on the ability of the medical officers to mould her into the desired pattern.

The presence of a dispensary raises the question of hospitalization, and it should be met at this stage by granting accommodation in the general wards of the district hospital to cases fit for collapse therapy, and if possible the erection of a separate ward for advanced cases requiring isolation. The gradual introduction of artificial pneumothorax treatment would probably meet with a reasonable degree of success, since in a community developing along normal lines there is a greater tendency for the population to become fixed and a lessened desire on the part of the individuals to bolt into the bush when they encounter something they do not understand.

The control of tuberculosis in municipalities and townships

In an established and long urbanized community the interested medical officer need search no longer for the existence of tuberculosis, but it is more necessary for him to study the trend of the disease in relation to economic and racial factors. Crocket emphasizes this fact when he says that despite the exposure of many successive generations and the improvement in the standard of living in the United Kingdom the incidence of the disease is no less. What has altered is the character of the malady since the rapidly progressive case is less often encountered, but much of the disease is of the concealed or latent variety. The need for careful surveys and examination of all available pathological evidence still continues and should not be neglected, if time is available, simply because routine methods of treatment have been organized along recognized lines and it is felt that there are no new fields to conquer.

In any urban area the establishment of a tuberculosis dispensary should be an accomplished fact, whether the local authorities or Government are responsible for its upkeep. The number of large towns throughout the tropics without any tuberculosis centres is surprising.

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especially as many are quite capable of undertaking the financial responsibility for such a project. It is more often due rather to fear of heavy financial commitments than to actual apathy; few realize that a dispensary can be run without any exaggerated expenditure. In urban communities where there is a responsible and well-to-do section, every effort should be made to encourage these better-class people to take a share in the work by providing financial aid and by working on committees in connection with the dispensary. Nor should the dispensary physician be content to work only at the dispensary: other preventive measures should be encouraged. The routine examination of school-children might well include monthly weighings and those who have lost weight should be examined clinically and by fluoroscopy. Hetherington states that latent apical tuberculosis of adolescents causes moderate loss of weight in some but not in all cases. As a rule, however, the writer has found that the scales form a good guide, and indicate the necessity or otherwise for further examination. Another method of prevention should be the fluoroscopic examination of school teachers at regular intervals; not only will this aid detection of cases, but it also has definite value as propaganda and interests the teachers in the question of tuberculosis.

In the smaller township, if such a one is available, a health officer who has held a resident appointment in an up-to-date sanatorium at home should be responsible for the tuberculosis work in addition to his other duties. In many of the large tropical towns the prevention of tuberculosis is rapidly becoming the most important health problem and the appointment of a full-time tuberculosis officer is no longer a luxury, but a necessity. In such areas the required standards for health visitors may well be raised and the posts filled by fully trained local nurses, especially those in possession of a health visitor's certificate.

Nor is the simple tuberculosis village alone able to meet the demands of a sophisticated community; the provision of more orthodox institutional treatment has to be considered.

There is no doubt in the minds of most tropical workers that the results of treatment are sufficiently good to justify the provision of tuberculosis institutions. To view the question solely in the light of direct results of active treatment is a mistaken policy. The propaganda effect of modern therapeutic methods is far more important than the end results alone. Nor must we forget the public health aspect of successful treatment lessening the number of infectious cases at large. Especially is this evident in ambulatory A. P. treatment, as by these means we are enabled to deal with those who refuse any but the minimum institutional treatment. Frimodt-Möller claims that of 807 patients traced after their discharge from his sanatorium in India after five years 54.5 per cent were still alive. Results such as these indicate that it is wrong to adopt the hopeless attitude so common in the past. If institutional treatment is to be carried out and the necessary resources are available, the erection of a hospital for all types of cases is indicated and not just a sanatorium for early cases.

Crocket advocates the establishment of a sanatorium to deal with all stages of the disease, from the hospital for its advanced cases to the labour colony for the convalescent ones. Those are exactly the lines that should be followed in the tropics. To build in one corner a lazaret for the dying and to erect on a different site a sanatorium for those who improve means that the advanced case will never seek hospitalization, unless he is absolutely forced by legal or economic requirements. But if within the same compounds we have all the necessary accommodation for each stage of the disease the sufferer will readily seek admission; even if he is assigned to the advanced wards, he sees about him those who have improved and the hope that it will not be long before he is able to cross the compound into the convalescent wards is ever present with him.

The hospital should be as near to commanding consistent with ample accommodation and suitable publicity. distance means transport and few natives are in some well off to pay even the few cents required for fuel, regular conveyance to and fro. This means that visits by friends and relatives are limited and furnishes an additional reason for not entering hospital. Even in tropical countries where sites are available in the hills, it appears inadvisable to make use of such sites on account of their distance, except for those able to afford the cost of transport. Suitable accommodation for those able to pay must be provided. Paneth as a result of his experiences in Java urges the necessity of establishing the principle of patients contributing whatever they can afford.

No tuberculosis hospital is going to get the best results if it can only obtain its cases when they have reached an advanced stage. The best way of obtaining cases in a reasonably early stage, apart from contact work, is by continuous propaganda. The tuberculosis officer must be prepared to speak in season and out of season; to-day in the tropics there are springing up innumerable societies for young men and women and these always welcome health talks. Propaganda amongst school teachers is one that brings the best returns; the teacher holds a very definite position amongst his or her neighbours and his advice is more often sought than may be the case in this country. Pictorial propaganda should be employed extensively; posters, magic lantern slides, cinematograph shows have all a great appeal. One thing they require, however, is local colour, as far as possible they should be prepared on the spot, those from abroad often fail to impress natives because they portray surroundings unfamiliar to them.

In view of the fact that early and energetic treatment is producing good results, even amongst the less resistant races, it is necessary to consider the question of after-care. Carter who had a wide experience of tuberculosis among the negroes of the U. S. A. said that tuberculosis is curable in the negro, but that he is so prone to return to his careless habits and to enter unsuitable occupations that the mortality after leaving the sanatorium is frightfully high. Frimodt-Möller at the Union Mission Sanatorium in the Madras Presidency has set up the nucleus of a tuberculosis colony to provide a living for poorer patients who leave the sanatorium in sufficiently good health not to require further treatment, but as yet not fit to earn their living by ordinary means. A small silk farm has been established and the product enables eight patients to earn a sum of money equivalent to what they would gain in ordinary manual employment elsewhere. In order, therefore, to give patients time to be completely restored to health, every effort should be made to establish after-care centres where remunerative and useful employment may be obtained.

The use of B. C. G. has not been stressed in view of the controversy still raging. It has been employed in Mauritius, but no results are available as yet. B. C. G. has been used in the French colonies since 1925 with apparently very satisfactory results. Toullec furnishes results from Dakar where the mortality among the vaccinated infants has fallen from 25 per cent to 10 per cent, whereas no appreciable decline has been noted in the unvaccinated groups.

The place of legislation in the anti-tuberculosis scheme requires careful consideration and Matthews has summed it up in a sentence that every tuberculosis worker would do well to commit to memory 'When a native thinks his disease can be cured or materially eased by medical aid, no law will be required to make him seek it'. The writer adheres to his view that it is a useful weapon to have in reserve, but it should be employed only as a last resource.

There are still many parts of the tropics where the native denied the treatment necessary for the arrest of tuberculosis would, if he but knew them, echo in his heartfelt manner those well-known sentences of Trudeau who recounts in his autobiography something of his feelings on being told that he had pulmonary

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despair filled my heart; I think ...ing of the feelings of the man at the ...s told he is to be hanged on a given date, ...n those days pulmonary consumption was ...onsidered as absolutely fatal.'

To-day much is being done to remove that feeling of hopelessness still present in less fortunate lands. Blanchard outlining the measures employed in French West Africa says that expansion of facilities for hospitalization and treatment is being actively pursued in all the French colonies.

Much more has yet to be accomplished; de Langen and Lichtenstein write 'Tuberculosis must come to form the most important problem of all tropical countries before very long. It is amazing to see with what degree of apathy the increase of tuberculosis is being regarded in East Asia. Millions are being spent annually for the eradication of leprosy, while for the fight against tuberculosis a few paltry thousands have with difficulty been raised. The mortality statistics of the Philippine Islands over the ten years ending 1930 show the relative importance of these two diseases to the community in a most striking way; out of every thousand inhabitants 54.1 died in the course of ten years from tuberculosis; 0.27 died of leprosy. The mortality from tuberculosis was, therefore, just over 200 times as high as that from leprosy; the difference in morbidity may well be left to the imagination! The time will come, and that right soon, when this ostrich-like policy will have to be set aside, and the terrible scourge that is threatening the East be met face to face'.

British Guiana is a small country situated right in the tropical belt, it has scanty financial resources despite its potentialities and is largely populated by a race peculiarly susceptible to tuberculosis. Yet to-day it can boast of having an active and efficient organization to deal with the menace of tuberculosis and a mortality rate from that disease (0.8 per 1,000) which many a greater and richer tropical region might well envy. What has been done there may be accomplished elsewhere.

Reviews

LEPROSY: DIAGNOSIS, TREATMENT AND PREVENTION.—By E. Muir, C.I.E., M.D., F.R.C.S. (Edin.). Sixth Edition. Published by the Indian Council of the British Empire Leprosy Relief Association, New Delhi. 192 pages. 85 illustrations

THIS is called the sixth edition of this book but actually it is a completely new book. The old edition had only 73 pages and a few illustrations, while for this edition the text has been entirely re-written and is nearly three times as long, while the illustrations are better and much more numerous. In the work of revision the author has been fortunate in obtaining the active co-operation of Dr. J. Lowe, his successor in Calcutta. As the author states in the preface, the book is issued primarily for the use of doctors in India, but it is hoped that workers in other countries also will find it useful.

The book is divided into three sections. The first and longest section deals with the history, epidemiology, bacteriology, clinical and histological features and diagnosis of leprosy. A feature of this section is the linking together of clinical and histological findings. Thus, for example, the histology of normal skin is described and then the clinical and pathological changes produced in it by the different forms of leprosy. The same plan is followed for nerve lesions. It is clearly brought out that the difference between the two main types of leprosy (here called 'neural' and 'cutaneous' according to the 'Manila' classification) is not primarily a difference in the site of the lesions but a difference in the nature of the tissue response to infection. This idea—that the varying types and degrees of tissue response to the invasion by the bacilli are the underlying cause of the widely varying clinical manifestations of leprosy—is constantly expressed throughout the book. These varying clinical manifestations are thoroughly discussed and excellently illustrated by photographs.

The section on treatment and prognosis occupies thirty-five pages and contains full and clear descriptions of the methods of preparation and administration of the various forms of chaulmoogra oil, but it also emphasizes strongly the importance of general treatment and hygiene. Various other useful medical and surgical procedures are described.

The third section deals with prevention and it stresses the limitations of treatment and the importance of isolation of infectious cases in the control of leprosy. The work of institutions is discussed, but the opinion is expressed that, in India and other such countries, isolation in institutions is possible for only a small proportion of infectious patients. The development of various forms of village isolation is therefore strongly urged. The formation of leper villages, the isolation of groups of patients outside ordinary villages and isolation of individual patients inside villages are discussed, the first two measures being favoured. The work of the leprosy clinic is described with emphasis on the importance of linking-up treatment work in the clinic with preventive work in villages.

This book is a most excellent one and should appeal to a very wide public. The clinical and practical aspects of leprosy are clearly explained, so that the book should appeal to the clinician and the general practitioner; the sections on epidemiology and control should certainly be read by every public health worker in India; some of the more technical aspects of leprosy are dealt with thoroughly and the book should therefore be of use to the specialist worker in leprosy.

The book is excellently printed and bound and is most excellent value for its low price.

THE BRITISH ENCYCLOPÆDIA OF MEDICAL PRACTICE INCLUDING MEDICINE, SURGERY, OBSTETRICS, GYNÆCOLOGY AND OTHER SPECIAL SUBJECTS. Under the General Editorship of Sir Humphry Rolleston, Bt., G.C.V.O., K.C.B., M.D., D.Sc., D.C.L., LL.D. 1938. Butterworth and Company, Limited, London. (To be completed in 11 volumes. Sold in complete sets only. Cash price, Rs. 25 per volume. Also available on the instalment system at Rs. 10 per month. Price, Rs. 26-8 per volume. Only available from Messrs. Butterworth and Company (India), Limited, Calcutta. Volume III. Pp. xxv plus 681 plus 54

THIS volume commences with 'cataract' and ends with 'diaphragm diseases'. Of special interest to readers in this country are the chapters on 'cholera' by Sir Leonard Rogers, and on dengue by Sir John Megaw. In each case the subject is one of which the writer has made a special study during his service in India and in which he has maintained his interest since his retirement from this country. In its essentials the treatment of cholera has undergone very little change from the position in which it was placed by Sir Leonard thirty years ago; the intravenous injection of alkaline and hypertonic saline is still the mainstay of the treatment. More recent introductions such as bacteriophage, in both prophylaxis and treatment, have been considered in detail and their importance judiciously weighed. On the other hand, the reader is given no encouragement to use the essential-oils mixture

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which must be looked upon as little more than a *placebo*—a *placebo* to the conscience of the physician.

The chapter on colitis is written by Sir Arthur Hurst, not a tropical worker, but a great authority on this condition, which, though more common in the tropics, is a cosmopolitan disease; the importance of tropical intestinal infections in the causation is not overlooked. The chapter on clonorchiasis, a tropical infection but one that does not occur in this country, is written by Dr. P. A. Maplestone who gives a short but concise account of the condition.

There are three useful chapters on certain eye diseases which happen to fall in the C's—cataract, and diseases of the cornea and conjunctiva; each of these is illustrated by an excellent coloured plate. The chapter on cataract is by Sir Stewart Duke-Elder.

Contraception is given about twenty pages: this chapter is written by Dr. Blacker, Hony. Secretary, Birth Control Investigation Committee, and Dr. Joan Malleson, Medical Officer of the North Kensington Birth Control Clinic. Different methods are described and discussed. The sheath, if properly used, should have a 100 per cent success. They place the failure rate with the Dutch cap at only 1 in 5,000 occasions.

Other important chapters in this volume are on cerebro-spinal fever by Dr. Letheby Tidy, on diabetes by Dr. Wilfred Oakley, and on dental sepsis in relation to systemic disease by Sir Norman Bennett.

This volume is distinguished by the large number of colour plates, all relevant and beautifully executed both as original paintings and in their reproduction; the picture of a child with cerebro-spinal fever is of Royal Academy standard. In other respects, the volume is quite up to the high standard of its predecessors.

SULFANILAMIDE THERAPY OF BACTERIAL INFECTIONS—WITH SPECIAL REFERENCE TO DISEASES CAUSED BY HÆMOLYTIC STREPTOCOCCI, PNEUMOCOCCI, MENINGOCOCCI AND GONOCOCCI.—By R. R. Mellon, M.D., Dr.P.H., D.Sc. (Hon.), P. Gross, M.D., and F. B. Cooper, M.S. 1938. Charles C. Thomas, Publisher. Springfield, Illinois (220, East Monroe Street). Pp. xiii plus 398. Illustrated. Price, $4.00, post paid

It is barely two years since the sulphanilamide flood burst on medical practice. The introduction of this series of drugs is not an advance to which one can truly apply the word 'revolutionary'; its effect has been much better than a revolution—in which the destruction of the old order is often a much more prominent feature than the construction of the new. But, if it has frustrated us in the use of one medical literary cliché, it has fully justified another, and we can say without fear of contradiction that it has added a whole battery to the 'armamentarium of the physician', and, incidentally, of the surgeon and of the obstetrician.

The physician or surgeon who has no originality in thought or experience, or who is fully preoccupied, or naturally indolent, usually rationalizes his lack of literary achievements, assumes an air of feigned modesty, and scoffs at his colleagues for 'rushing into print'. The enterprise of the authors and publishers of this book must, however, gain the admiration of all, even of the owners of completely silent pens; to produce a book of 400 pages on the sulphanilamides well within two years of their first clinical application is no mean achievement.

The first section of the book is a review of the literature on the chemistry and pharmacology of the sulphanilamide compounds, and on the early *in vitro* and *in vivo* experiments on their bactericidal properties. The last chapters in this section are on the chemotherapeutic results achieved in streptococcal and in other infections, respectively, in man.

The second section deals with the authors' own experimental work on the bacteriostatic properties of these compounds, with the therapeutic properties in streptococcal infections in laboratory animals, and in pneumonia and streptococcal meningitis in man.

In the third section they discuss [illegible] action and the part played by the [illegible] commanding mechanism, and in the last the criteria of [illegible] publicity. sulphanilamide compounds.

There is a bibliography of three hundred references, some an addendum in which the most recent work is reported, an authors' index, and a subject index.

Altogether it is a very valuable contribution on an important topical subject, and the authors and publishers are to be congratulated, not only on their enterprise and expedition but on their mastery of all aspects of the subject and on their method of presenting it.

DISEASES OF THE SKIN: FOR PRACTITIONERS AND STUDENTS.—By G. C. Andrews, A.B., M.D. Second Edition. 1938. W. B. Saunders Company, Philadelphia and London. Pp. 899 with 938 illustrations. Price, 45s.

We are unacquainted with the first edition of this book which apparently was published eight years ago. According to the preface a great many additions have been made both to the text and the figures. There are one or two statements in it with which we cannot altogether agree. For instance, the author says 'The pathology of each disease is now fully discussed . . .' would, in our opinion, be more correctly rendered 'the histological appearance of the principal diseases is briefly described'; nor could we find any special discussion on allergy as we were led to expect.

A new chapter has been added on virus diseases, as well as one on vitamin deficiencies, and another on infiltrations of metabolic products. This is a good move because the ætiological influence of all three factors is now well recognized in dermatology and they make three distinct and handy groups. At the same time we hardly think it right to consider aphthous fever as a skin disease, and the inclusion of seborrhœic warts and senile keratosis in virus diseases is not in accord with accepted opinion of their cause.

We were also surprised to find a brief and inadequate description of hookworm disease in a book on dermatology. It is here apparently for two reasons. The first because of the local reaction and subsequent secondary infection commonly seen at the site of entry of the larvæ, and the second because 'After the disease is developed ulceration of the legs is common'. The first may possibly be accepted but the second is based on the fact that in communities where hookworm infection is practically universal leg ulcers are as a rule not uncommon, so the two conditions are bound to co-exist fairly frequently. To infer an ætiological connection between them seems unjustifiable.

The above are only minor criticisms that have appealed to us as we have gone through the book, but if one regards it from the general rather than the particular point of view it is an excellent complete summary of diseases of the skin. This will be readily understood when it is noted that the total number of pages, including the index, is only 899 and there are 938 figures.

The illustrations deserve special commendation because without exception they are clear and informative. Judging from the acknowledgments the author has collected his illustrations from all over the world, which in a large measure explains their excellence.

The book is bound with the new familiar flexible back which is a feature of the publishing house of Saunders. It allows free handling of a heavy volume without fear of damage to the binding.

As a reference book on dermatology for the general practitioner we think this publication should be of special value, largely because the numerous and characteristic photographic reproductions will greatly assist the tyro in making a diagnosis.

P. A. M.

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...MONG CHILDREN AND ADULTS. ... Myers, Ph.D., M.D., F.A.C.P. Second ... 1938. Published by Charles C. Thomas, ...nois and Baltimore. Pp. xviii plus 401. Illustrated. Price, $4.50

THE first edition of the book was published in 1930 under the title of 'Tuberculosis among children', with an admirable introduction from Allen K. Krause. This, the second edition, is completely re-written; it is divided into three parts—part I deals with the pathology, diagnosis, prognosis and treatment of tuberculosis in infancy, part II with tuberculosis in childhood and part III with tuberculosis among young adults. The preventive aspects of the disease have been amply emphasized.

The author, who is in charge of tuberculosis work at the Lymanhurst school of tuberculous children, Minnesota, points out that a very close relationship exists between the benign first infection type of tuberculosis in children and the clinical re-infection type of disease in adult life. The childhood type of infection prepares the way for the adult type of tuberculosis, in which re-infections from exogenous sources play a large part in a fair proportion of cases. He thinks that in infancy and childhood lies the fountain head of tuberculosis and that through careful study of children in schools and homes, large numbers of unsuspected spreaders of bacilli can be detected, while the detected children can be surveyed and guided throughout successive epochs of life, particularly through young adult life. As an argument in support he brings out the fact that, although tuberculosis had declined in the west, there has been very little reduction in death rate in young adults from 15 to 24 years. He, therefore, pleads for continuous supervision from childhood up to adult age. Dr. Allen K. Krause has admirably summed up the position in the following paragraph of the introduction written by him: 'That "the child is father to the man" is never truer than in the domain of human tuberculosis. Seeds strike root in childhood; roots take firm or weak hold as the immature body wrestles with the stresses of growth and development poorly or well; fruition, pulmonary phthisis, bane of a cooped-up civilization, bursts as life's powers unfold to the full with the coming of adult years. This is the story of the common run of tuberculosis patients; they reap what indifferent circumstance has sown in them in long-forgotten bygone years: touched by tubercle bacilli, they are the unlucky heirs of accident and ignorance, of which ignorance is perhaps the more prolific breeder.'

The addition of chapters on sensitization and immunity, of two chapters on tuberculous meningitis and chronic non-tuberculous basal pulmonary diseases in childhood by C. A. Stewart and of a chapter on tuberculous disease of the bones and joints have enhanced the usefulness of the book. The scientific facts are accurately and well presented. The book will be found to be useful to students and practitioners, as well as to sanitarians.

The printing and get-up reflect credit on the publishers.

A. C. U.

TREATMENT IN GENERAL PRACTICE: THE MANAGEMENT OF SOME MAJOR MEDICAL DISORDERS. Volume II. Articles republished from the *British Medical Journal* Second Edition. 1938. H. K. Lewis and Company, Limited, London. Pp. xii plus 436. Price, 10s. 6d.

A REVIEW of the second edition of the first series of these reprinted papers on treatment appeared in the last number of the *Gazette;* we refer our readers to this. We are glad to see another edition of the second series. As in the case of the first edition, many of the articles are reprinted in their original state, others have been touched up, but we believe we are right in saying that none has been re-written. Why indeed should they be? It is only two years since the first edition was published and in that time advances have been made but no revolutions have taken place.

In this volume diseases of the nervous system, diseases of the blood, metabolic and kidney diseases, and rheumatic diseases are dealt with. The writers are representative of the British School, and L. J. Witts, J. F. Wilkinson and L. S. P. Davidson are amongst the writers on blood diseases.

The most important advance in the last two years has been the introduction of sulphanilamide. In the chapter on migraine, ergotamine tartrate has been mentioned. It is a drug that has as yet scarcely found its proper place in the treatment of this difficult condition, but it is a promising recruit. Special reference to individual articles would be out of place; however, the same high standard, set in the first series, is maintained throughout the second. These two volumes really should find a place on every practitioner's desk.

ELECTRO-THERAPY AND LIGHT-THERAPY.—By RICHARD KOVACS, M.D. Third Edition. 1938. Henry Kimpton, London. Pp. 744. Illustrated with 307 engravings and a colour plate. Price, 35s.

THE second edition of this excellent work appeared in 1935 when it was duly noticed in these columns. The third and latest edition has been considerably enlarged by the author. The very excellent chapter on the physics of electro-therapy has been completely revised and should make very easy reading for medical men with the minimum of equipment in physics. An entirely new chapter has been written on the relation of physiology and electro-therapy. The chapter on general electro-therapy has been considerably enlarged. The section on galvanism has been entirely re-written. The recently introduced methods of vaso-dilatation by ionization with histamine or mecholyl are ably discussed. The chapter on electro-diagnosis including condenser testing and the chronaxie has been enlarged.

One of the most remarkable portions in the book is that on short-wave diathermy. Two entirely new chapters have been added giving clinical indications and contra-indications and the technique of this method in great detail. Electro-pyrexia is the subject of a new chapter.

The subject of light-therapy has also been elaborated.

The book is provided with a very useful glossary and an adequate index. It is the standard work on the subject in America.

Dr. Kovacs is a man of international reputation and a distinguished authority in his sphere.

Physicians who are apt to raise their eyebrows at the mention of electro-medical methods of treatment will find much food for thought here. The practitioner in electro-therapy will find it an invaluable addition to the volumes on his consulting-room table where it will always form a reliable work of reference. We would specially commend it to aspirants for the D.M.R.E.

G. G.

THE DIAGNOSIS AND TREATMENT OF DISEASES OF THE BLOOD.—By T. Ordway, M.D., and L. W. Gorham, M.D. Revised by R. Isaacs, M.D. (Reprinted from Oxford Monographs on 'Diagnosis and Treatment'.) 1937. Oxford University Press, London and New York. Pp. xi plus 605. Illustrated. Price, 32s. 6d. Obtainable from Oxford University Press, Bombay and Calcutta

HAEMATOLOGY has made very great advances during the last decade and many new books on the subject have appeared. We cannot therefore support the action of the publishers in re-issuing this 8-year-old volume in which a few, a very few, pages have been interpolated in an attempt to bring it up to date. The failure is no fault of the new editor: it just cannot be done this way.

There is much to be said for the book if one can carry oneself back eight years. The arrangement is good and the descriptions clear. There are some valuable plates which are not in any way out-dated. There are references at the end of each section, but in many instances the most recent reference is 1926.

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These well-known publishers have recently been responsible for two excellent books on this subject, Castle and Minot's and Janet Vaughan's, and we cannot understand why they have now attempted to revive this one.

L. E. N.

SALTS AND THEIR REACTIONS: A CLASS BOOK OF PRACTICAL CHEMISTRY.—By L. Dobbin, Ph.D., and J. E. Mackenzie, D.Sc. Sixth Edition. 1936. E. and S. Livingstone, Edinburgh. Pp. ix plus 246. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 4-8

This is a class book of practical inorganic chemistry meant for students going up for 'First Science', 'Preliminary Scientific', 'First Professional' and other examinations of the universities and of the Royal Colleges of Physicians, Surgeons and Veterinary Surgeons of Great Britain.

In the first section, dealing with the nature and properties of the salts, the theoretical aspects have been explained and in the second section some general methods of preparing salts have been introduced. The third section is divided into two parts, one dealing with the reactions due to the metallic radicals and the other dealing with reactions due to the acidic radicals. All these reactions have been carefully explained with the help of equations. The next section deals with the dry-way reactions and finally there is a section dealing with some typical volumetric analyses. There is an appendix describing experiments with some common organic substances such as carbohydrates, alcohols, oils, milk, albumin, etc.

This handy volume has already passed through several editions and written as it is by authors having wide experience among students, it would prove valuable for the I.Sc., B.Sc., or medical students of the Indian universities and faculties.

S. G.

THE FOOT.—By Norman C. Lake, M.D., M.S., D.Sc. (Lond.), F.R.C.S. (Eng.). Second Edition. 1938. Baillière, Tindall and Cox, London. Pp. viii plus 366, with 113 illustrations

The appearance of a second edition of this book within the brief space of three years may be taken as adequate testimony to its utility and popularity. The value of the present edition has been greatly increased by the addition of new chapters on congenital club foot and foot problems. Although a great deal of fresh matter has been incorporated in addition to numerous illustrations, the body of the book has been kept within reasonable limits, on which the author may be complimented. The inclusion of a bibliography and a glossary of the New English Nomenclature will be useful to the reader.

We hope that this edition will prove to be at least as welcome as its predecessor. It would be a useful addition to the library of the general practitioner. The printing, get-up and illustrations are excellent.

P. N. R.

THE AMERICAN POCKET MEDICAL DICTIONARY. —Edited by W. A. Newman Dorland, A.M., M.D. Sixteenth Edition. 1938. W. B. Saunders Company, Philadelphia and London. Pp. 973. Price, 8s. 6d. (plain). 10s. 6d. with Thumb Index

This dictionary first appeared in 1898 so that with the present volume 16 editions have appeared in forty-one years, which is sufficient evidence of the steady demand it must enjoy.

Unfortunately the term 'pocket' is becoming rather misleading for it now measures about 1¼ inches in thickness. This is not the fault of the publishers because to keep it up to date many new words have to be constantly added, and old ones cannot be discarded; in the present instance it has been increased by over 2,500 new words bringing the total to over 50,000. When this aspect is considered it is remarkable that the book has been kept as slender commanding it would make an unsightly bulge in the publicity. fashionably dressed practitioner it is small ...ces, ...ome be quite unobtrusive on the consulting-room desk.

P. A. M.

A TEXTBOOK OF MEDICINE FOR NURSES.—By E. Noble Chamberlain, M.D., M.Sc., F.R.C.P. Third Edition. 1938. Oxford University Press, London, New York and Toronto. Pp. xviii plus 460. Illustrated. Price, 20s. Obtainable from Oxford University Press, Bombay and Calcutta

This book has long been recognized by nurses for its usefulness. The third edition will be welcomed. The arrangement, which is based on the syllabus of the General Nursing Council of England and Wales, is a help to those studying for examinations. As this syllabus forms the basis of some of those laid down by registration councils in India, the book will be as valuable to nurses in this country as in England.

Tropical diseases are included, and the appendix of tests and summaries is most helpful. Although no new chapters have been added many of them have been enlarged and the number of illustrations has been increased.

It is a book every nurse should endeavour to have in her possession, not only for the purpose of passing examinations, but for reference during her career. No library in a nurse-training school should be without a copy of this valuable contribution of the education of the nurse.

M. D. W.

A MANUAL OF SURGERY FOR NURSES.—By C. Wells, M.B., F.R.C.S. 1938. E. and S. Livingstone, Edinburgh. Pp. viii plus 409. With 159 illustrations. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 7

With the rapid advances which are being made in the technique of modern surgery, the competent and reliable nurse is becoming more and more of a necessity. She is expected, not only to follow intelligently all recent advances in pre- and post-operative treatment, but also to handle and maintain in use intricate apparatus.

This book, consisting of 396 pages and 33 chapters, is of a handy size and successfully embodies the two main objects of the author, namely, to introduce the student nurse to the science and craft of surgery in a clear and straightforward manner, and to present the subject-matter in the form most likely to prove helpful. 'Pathological processes are described as fully as is necessary to clarify the clinical picture, and symptoms and signs are stressed whenever they are of especial importance from the nursing point of view.' There are numerous well-set-out diagrams and also a comprehensive anatomical plate for frontispiece.

We have much pleasure in recommending this useful little book not only to those for whom it is intended, but also to members of the medical profession. The printing and get-up are of good standard, and there is a useful index.

P. N. R.

MENTAL NURSING IN OBSERVATION WARDS.—By I. M. Sclare, L.R.C.P.S. (Edin.). 1938. E. and S. Livingstone, Edinburgh. Pp. xii plus 259. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 4-8

This very readable book is presented in 13 chapters, and in its preparation the aim has been to present clear pictures of the common types of psychoses and psycho-neuroses which are to be met in any observation ward. All the chapters are well written, and are so correlated as to give the reader a sound idea of the care required by mental patients of the various types. The author tries to do justice to the psycho-analytic school of thought, but his own experience in the treatment of a dipsomaniac by psycho-analysis—the duration

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...as over two years—illustrates the ...his method of treatment in hospitals. ...ers on normal psychology and anatomy and ...ology are well written, with emphasis upon certain ...spects which are important from the nursing point of view. The last two chapters deal with the practical side, and though designed for the nursing profession, the student and physician will likewise find them refreshing and informing.

It is a thoughtful and useful book written by a well-experienced psycho-therapist. Concise, yet not sacrificing detail, the book may be read alike by general practitioners, nurses, and all who are charged with the responsibility of the care of the mentally ill. It is unfortunate that the author has not added a chapter on occupational therapy, otherwise the book covers the complete ground required by the nurse who is desirous of obtaining the Certificate of Proficiency in Mental Nursing, granted by the Royal Medico-Psychological Association. It may not be generally known that the examinations for this diploma are periodically held in India at the Ranchi European Mental Hospital.

A METHOD OF ANATOMY: DESCRIPTIVE AND DEDUCTIVE.—By J. C. Boileau Grant, M.C., M.B., Ch.B., F.R.C.S.E. 1937. Baillière, Tindall and Cox, London. Pp. xx plus 650, with 564 figures. Price, 27s.

In this book the author has presented a new method of approach for the study of human anatomy. No doubt many excellent textbooks are available, but many of these are much too big for the purpose of medical students.

Professor Grant's departure from the traditional lines of writing textbooks will be welcomed by students and teachers alike, for this method of presentation has not only made the subject more interesting, but has made the matter simpler, rational, and easily understood. He has laid stress upon the underlying principles involved and shown a new way to get at the anatomical facts by a process of deduction. The formidable and unpleasant task of memorizing anatomical relations has thereby been reduced to a minimum.

In every region a predominating structure has been considered first, and the parts have been constructed around it; such a structure, whether a muscle, bone, nerve, or vessel, has been very aptly named a 'key structure' which when grasped will undoubtedly enable the reader to unlock the intricacies of various relations. The significance and bearings of the relations on the clinical studies have been kept constantly in view.

The book has been treated on a regional basis. The abdomen; thorax, extremities, and head and neck have been allotted one chapter each. The pelvis has been considered in a separate chapter. The seventh chapter is miscellaneous and contains considerations of individual cranial and vertebral bones, and a general outline of joints into three types which appear to be simple and at the same time very practical.

All chapters have been uniformly treated and, whenever clear understanding of relations or of the real nature of the structures demanded, the morphological and embryological elucidation has been incorporated, especially in the chapter on the abdomen. The text has been fully illustrated; a special feature of the illustrations is their simplicity—all being line drawings—and accuracy.

No special section has been allotted to osteology but in every region important bones have been discussed with special reference to their relations to the soft structures. The general principle underlying the study of the long bones has been lucidly presented and the conventions in the terminology explained in the schematic figures, 48 and 50. Muscular actions and movements of the joints have been explained when necessary by diagrams; figures 93, 94 and 95 illustrate the various movements of the shoulder girdle in a way which should be readily understood and easily remembered by students. The illustrations are mostly original and fully explanatory to the context.

We have found the book to be pleasant throughout and full of sound information which is not mere condensation of facts but a clear and precise exposition of various relationships and their full clinical bearings. Every section is equally interesting. If the aim of the study of anatomy in the medical schools be chiefly to enable students to understand the medical and surgical problems of the human body, Professor Grant has succeeded remarkably well in achieving this end; for he has shown very creditably through a limited space of 600 pages how not only the subject can be read with interest and learnt, but also what is more important, how such lessons can be retained.

We have no doubt that the book will appeal to all students and teachers during their pre-clinical and clinical studies alike, and it fully deserves a place in every medical library.

S. C. S.

AIDS TO HISTOLOGY.—By A. Goodall, M.D., F.R.C.P.E. Fourth Edition. 1938. Baillière, Tindall and Cox, London. Pp. viii plus 151. Illustrated. Price, 3s. 6d.

That this little book has been useful to many, will be borne out by the fact that it is passing through its fourth edition. The present volume has been revised, and some new sections are added, *e.g.*, ossification, hæmatology, and ductless glands. An account of all kinds of tissues is included, a few of which are illustrated.

To us it seems that the book will more meet the purpose of the advanced student, than serve as a guide to the beginner. To those who have already done work in the laboratory and are in the need of a small compendium having all essential facts of histology, for which they cannot devote the time necessary to go through larger textbooks, it will bring relief by helping them to marshal the facts observed during their class work, for revision before their examinations.

S. C. S.

AIDS TO EMBRYOLOGY.—By R. H. Hunter, M.D., M.Ch., Ph.D., M.I.R.A. Third Edition. 1938. Baillière, Tindall and Cox, London. Pp. viii plus 178. Illustrated. Price, 3s. 6d.

As one of the 'Aid Series' this book needs little introduction and the fact that it is passing through the third edition speaks of the popularity it has gained already.

The present edition, though it maintains its old form, has some sections revised and entirely rewritten. Chapter II is new and contains a compact but lucid account of modern conceptions on 'the transmission of hereditary characters'.

The recent idea of the relations of the oestrus-producing substances to the changes in the uterine mucosa has been incorporated, and the actions of prolan A and B and the factors X and Z are well illustrated in an original schematic diagram. Every chapter has been brought in line with modern views. The book has been further enriched by providing a summary at the end of all important sections and also by inclusion of a list of common anomalies that are usually met with in the dissecting room or obstetrical wards.

The book is a succinct exposition of all the embryological problems, sorted out from the vast mass of the present-day literature.

Complicated problems have been illustrated by suitable sketches, which will help the reader to visualize the process involved. The book fully covers the syllabus under the new regulations of the General Medical Council.

We are sure in the present volume will be found all relevant matter in a nutshell suitable for revision purposes which all students before their ordeal look for.

S. C. S.

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Abstracts from Reports

REPORT OF THE INTERGOVERNMENTAL CONFERENCE OF FAR EASTERN COUNTRIES ON RURAL HYGIENE HELD AT BANDOENG (JAVA), 3RD TO 13TH AUGUST, 1937. LEAGUE OF NATIONS HEALTH ORGANIZATION, GENEVA

This is a very important publication and it is difficult to abstract satisfactorily as we feel that none of it should be omitted. We give below the resolutions and recommendations of the various sections of the Conference, as they sum up the opinions of the large body of experts who attended the meetings.

Health and medical services

Resolutions

In Eastern countries more than anywhere else, preventive medicine is the cheapest means of improving the health conditions of the population in the rural areas, and it is along preventive lines that the effort should be principally directed.

2. The system suitable for a given area may be that in which curative and preventive work are combined in one organization, or that in which the two are carried out by separate organizations. Where economic conditions have allowed the adoption of the latter system, care should be taken that neither organization should develop disproportionately to the other and that where this disproportion exists, it should be corrected.

Where the former system has been adopted and the same personnel are responsible for both curative and preventive work, it is important that the preventive work should not be neglected. The time and effort which auxiliary personnel devote to curative and preventive work respectively should be determined by the superior staff.

3. As ultimately the preventive and curative work must be organized on a basis of accurate knowledge of the diseases and disabilities in an area, the importance of collecting accurate vital statistics cannot be over-emphasized. Our knowledge of morbidity in wide rural areas is very insufficient and it is therefore essential that every effort should be made to increase and improve it.

4. It is absolutely necessary to bring medical and health services as near to the population as possible, but the decentralization of activities should be guided and supervised by a central body in order to maintain efficiency and ensure a uniform policy.

5. While it is believed that decentralized preventive effort brings, comparatively, the greatest benefit to the health of the rural population at relatively the smallest cost, the means of applying this principle must necessarily vary with different local conditions and resources. No single type of organization can be recommended for general adoption, but it is essential that, whatever the means may be, they should be applied with sufficient thoroughness to make the beneficial effect of preventive work clear to the rural population and that the area of operations should be defined accordingly. The likelihood of attaining results which are permanent is increased if the size of the field of operation is determined in accordance with the capacity of the staff.

Progress will depend on gaining the confidence of the people by demonstrating to them the benefits of preventive work, so that they will voluntarily take a share in the work by contributing to it in money or in labour.

A preliminary study of local conditions and requirements in the villages themselves should serve as a basis upon which details of the local services can be organized.

The kind of organization employed, the commanding preventive work by different countries, publicity, described in detail in the respective national reports.

6. As regards the question of the training of medical men, it has happened in many Eastern countries, as elsewhere, that medical education has evolved from a simple beginning to a modern Western standard. This historical process of evolution should be accelerated as much as possible.

7. The Conference considers that, commensurately with its resources and its level of general education, every country should, in the sphere of medical education, attain the highest scientific level of theoretical and practical training, which should include facilities and opportunities for research. The spirit of preventive and social medicine should permeate more and more the whole programme of medical studies.

8. The Conference emphasizes the importance of adequately training a large body of auxiliary personnel in order that the connecting link between the rural inhabitant and the medical men may be as efficient as possible.

It also considers that the following views expressed in the report of the Preparatory Committee should be accepted as sound and followed as closely as possible, *viz*, that—

(*a*) their training should be as simple and practical as possible;

(*b*) care should be taken to ensure that their training does not make them lose touch with the people;

(*c*) remuneration should be adjusted to the economic conditions prevailing in the country districts;

(*d*) they should not take up their practice at too early an age;

(*e*) more importance should be attached to character (sense of duty, self-reliance) than to superficial erudition; and the Conference would add

(*f*) that instruction at least in hygiene of traditional or indigenous midwives during a transitional period may be required in some regions.

9. Emphasis is laid on the necessity for ensuring that all members of the auxiliary staff receive adequate training in hygiene and preventive medicine. The composition of the auxiliary staff relative to the kind of work they are called upon to do will vary in different areas.

10. At present it is not possible to state what should be the *per capita* expenditure or the percentage of the general budget which should be allocated to medical and health services.

11. It is essential that all Governments be convinced of the importance of public health and be prepared to finance it liberally. They must be imbued with the view that public health expenditure is a wise and profitable investment of public funds, and should adopt a more generous policy in this respect.

12. It is essential all Governments should realize that, while difficult to express in terms of money, the economic loss caused throughout the Far East by ill health is a vital factor in determining the ultimate welfare of a country. No administration claiming to have the well-being of its people at heart can afford to overlook this.

13. Funds may be either central or local. It is advisable that the principle of local support be inculcated whenever possible and that the proportion contributed by local bodies should gradually increase. But to meet cases where local bodies with the responsibility for public health have not the means fully to finance it, the Central Health Department must provide annually in its budget adequate funds to supplement the deficiency, so that the necessary services may be supplied under proper supervision.

14. Approved voluntary agencies and associations should be encouraged to contribute to health activities.

15. It is essential to the proper functioning of a health service that the emoluments offered be fully adequate so that the right type of man with proper training may be attracted and retained, and enabled to devote his full time to the service.

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...ued that Administrations, when ...is for health purposes, bear in mind ... points:—

The financial saving and the economic advan...es which result from employing the local people of the country and from using local materials, wherever practicable, in construction and maintenance of works in rural areas;

(*b*) The value in times of financial prosperity of forming a reserve fund to be set aside for health and medical services in times of economic depression so that the necessary continuity of work may be safeguarded.

Rural reconstruction and collaboration of the population

1. The Conference strongly emphasizes the importance and urgency of rural reconstruction as a primary responsibility of every Government.

2. The Conference is of the opinion that one of the first steps in rural reconstruction that each Government should undertake is the co-ordination of the activities of its various agencies, both in planning and execution, so that the Government services to the population may be integrated, comprehensive and effective.

3. In the opinion of this Conference, it is necessary that every village or group of villages, as the case may be, should have an organization of its own, namely, a committee for conducting its affairs and promoting its welfare in all directions.

4. There should be an organization of control—namely, a committee of management consisting of Government experts, representatives of villages and other non-officials—to advise village committees as to the programme to be undertaken and to see that the programme is carried out, due consideration being given to the psychology of the peasant.

5. The village committees may be entrusted with duties relating to—

(*a*) water supply;
(*b*) sanitation, house improvement and village-planning;
(*c*) construction and maintenance of village roads and waterways;
(*d*) social and recreational activities including playgrounds;
(*e*) education of adults, both men and women.

6. Every village or group of villages should have, as far as possible—

(*a*) a health centre or unit;
(*b*) a school and library;
(*c*) co-operative societies;
(*d*) demonstrations of improved agricultural practices;
(*e*) facilities for improved animal husbandry, including the provision of preventive veterinary services;
(*f*) home gardens;
(*g*) home industries.

7. The Conference calls the attention of the Governments to the success achieved by the establishment in strategic points of rural welfare centres with adequate extension facilities. The welfare centre experiments with methods of approach, introduces improvements, enables the experts to collaborate and affords facilities for the field training of workers.

8. The Conference realizes that any success in rural reconstruction is dependent on the presence of properly trained personnel and that it is therefore necessary that adequate facilities should be provided for the formation of technical personnel needed in all branches of work. The selection and training of suitable personnel, both men and women, is all-important. The training must be of a practical nature, including actual participation in rural work.

9. The Conference, realizing the increasing importance of the rôle which must be played by women in rural reconstruction, urges that everything be done to ensure that women shall be given all opportunity to develop their activities in this important field.

10. The Conference desires to emphasize the important part to be played by the village school in the work of rural reconstruction. It is essential that rural schools have a curriculum of study specially suited to prepare their pupils for rural life, not only because of the obvious necessity for such training, but also because of the prestige that attaches to things taught in the school. This means that the teachers' training-colleges must give training to that end. The curriculum of rural schools should comprise reading, writing and arithmetic, health, physical training and games, agriculture and nature study, manual training (training in the use of tools and materials for boys, needlework and domestic science or housecraft for girls) and citizenship. Special emphasis should be given to health education.

11. In the belief of this Conference, without land reform in many countries, rural reconstruction will not rest on a permanent basis; serious consideration of this problem and the study of methods best adapted to local conditions are urgently recommended to Governments.

12. The Conference would request the League of Nations to make arrangements to collect and make available information regarding successful examples of rural reconstruction in various countries.

To that end, the Conference suggests that the information be collected by a special group of persons who are closely engaged in such work. The group will visit various countries and make a special study of rural reconstruction centres. Their report should be published for general information.

Sanitation and sanitary engineering

1. The Conference recommends that Eastern Governments should each constitute committees for small-village planning in order to avoid *laissez-faire* development, and that these same agencies should set up local standards dealing with details regarding siting, types of houses, building material, ventilation, lighting and heating, waste disposal and water supply. In particular, it is emphasized that the kitchen should not be inside the living part of the house and that cattle-sheds should be detached.

2. The Conference suggests that a good water supply should be provided in all rural areas.

The Conference further suggests that, when possible, grants from public funds should be made available to provide good water and that financial return on such schemes should not be a matter of primary consideration.

The Conference recommends that new water supplies delivered to rural areas should be of the same recognized standard of purity as those approved for delivery to large towns; no new pipe-line supply should be installed unless the purity of the water conforms to this standard.

Where the supply of water of the above-mentioned quality is not feasible, it is recommended that properly constructed wells with cover and pump should be provided where possible; existing wells should be improved, and requirements to prevent contamination of wells should be promulgated.

3. (*a*) The Conference is of the opinion that the proper disposal of human excreta is of the utmost importance to the health of the rural population.

(*b*) In those Eastern countries where the use of manure for agricultural purposes is of primary importance, human excreta and household refuse should be dealt with in a way suitable for placing the product on the land as manure.

(*c*) The question of the pollution of water in wells by pit latrines is a matter that needs further investigation, and it is recommended that Eastern Governments should consider undertaking such investigations.

4. (*a*) The Conference recommends that more research work concerning flies should be undertaken, and suggests that it should be based on the lines indicated by the League of Nations document *C. H. Hyg. rur. E. H.* 15(I).

(*b*) The Conference recommends that the programme of study should also include investigations into the alleged efficacy of dung- and refuse-stacking and of composting as a means for the prevention of the breeding of flies.

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Nutrition

1. The Conference emphasizes the importance of diet in relation to health problems in the East. The available evidence suggests that under-nourishment and malnutrition are widespread and that much impairment of physical development and general health, low vitality and actual disease result from insufficient and improper diet. While the problem is difficult to attack, being largely bound up with economic conditions, the Conference nevertheless feels that there are possibilities of improvement and progress in many directions. It therefore hopes that Governments will increasingly support work in this field.

2. The establishment in each country of National Nutrition Committees is recommended. These may suitably include, in addition to nutrition workers, representatives of various departments of State, including public health, medical, educational, agricultural, animal husbandry and fisheries departments. The task of the Committees would be to advise their Governments on matters pertaining to the food and diet of the people.

3. The Conference considers that a central institute or laboratory concerned with nutrition research and its practical applications should exist in all Eastern countries.

4. The Conference recommends the training and employment of selected public health workers to act as specialists in the field of practical nutrition. Such workers may suitably be attached to central and provincial health departments. They can carry out field investigations, engage in propaganda work, organize school-feeding schemes, advise regarding the dietary aspects of maternity and child-welfare work, regulate diet in Government and charitable institutions, such as boarding-schools, mental homes, leper asylums and so on, and in general assist in the practical application of nutritional science.

5. The Conference recommends that close collaboration should be established between nutrition research institutes and agricultural and other departments concerned with food supply.

The nutrition worker can consult the agricultural expert about the practical possibilities of the changes and improvements in diet he recommends; conversely, the agricultural expert can obtain guidance from the former regarding desirable improvements in diet which may be furthered by crop-planning, better agricultural techniques, selective breeding methods, improved manuring, composting, etc.

6. The Conference emphasizes the fact that the degree of milling to which rice is subjected is of vital importance in connection with the problem of nutrition throughout the East. In many countries, the poorer classes consume foods other than rice in small quantities, and it is very difficult, for economic reasons, to increase the amount of supplementary foods in the diet; in such circumstances, the nutritive value of the main article of food, which is influenced by the degree of milling, becomes of great significance. The Conference recommends that only under-milled rice should be supplied in Government institutions. Efforts to popularize the use of under-milled rice by education and propaganda should be increased. It deplores the increasing tendency of urban and rural populations in the East to consume highly milled rice. It strongly recommends that Governments should make a thorough investigation of the nutritional, commercial, economic and psychological aspects of the problem, attention being given to the possibility of checking the spread of mechanical rice mills in rural areas, with a view to conserving the healthy habit of consuming home-pounded rice, and to means of making under-milled rice easily available everywhere for those who wish to purchase it. This problem might be among the first to be considered by the National Nutrition Committees recommended in paragraph 2.

7. The Conference notes the technical report which is appended and recommends that the report should be submitted to Governments for comment. The latter may suitably refer the report to the National Nutrition Committees or to some other appropriate body. The technical report contains a number of suggestions commanding nutrition research. The Conference hopes that Governments will inform the Health Organization regarding publicity, institutions which would co-operate in carrying out investigations of the type outlined. It suggests that detailed reports on the progress of studies should from time to time be sent to the Health Organization, if necessary in the original language.

It is further recommended that the technical report on nutrition should be submitted to the League of Nations Technical Commission on Nutrition, and that the Health Organization should undertake to establish contact between that Technical Commission and nutrition workers in the East.

Malaria

I. The importance of malaria.—Malaria kills more people and does more damage to physical, social and economic welfare in rural portions of Far Eastern countries (especially in the tropics and sub-tropics) than any other disease. This has been once again emphasized in the preparatory national reports and by the testimony of leaders of delegations to this Conference. Yet malaria is insidious and, except in epidemic form, it does not manifest itself with dramatic power sufficient to attract attention and funds commensurate with its ability to destroy health and prosperity. This Conference desires to emphasize the outstanding importance of malaria, and to urge lay and health administrators so to formulate their budgets that the amount of money and energy devoted to the control of this disease will be in proportion to its paramount importance.

II. Administrative policy as regards malaria control.—The Conference, in the first place, considers that the technical assistance of staff specially trained in malaria work is absolutely essential if an administrator is to deal successfully with malaria control. This consideration follows the general lines suggested by the League of Nations Malaria Commission as far back as 1924. Any malarious country which to-day has no health personnel skilled in malaria technique must be regarded as an anachronism. But the Conference believes that responsibility for malaria control should rest squarely on the minister or other officer in charge of the public health policy of a country and not on the technical expert.

The Conference, secondly, recommends that, since malaria is a focal disease in any country—absent in some rural areas, lightly prevalent in others, and moderately or heavily endemic elsewhere—the structure of, and programme for, rural health organization, including health units and health centres, should not be stereotyped, but flexible. In those areas where malaria is the outstanding social and health problem, the resources of the health administration, specially augmented where necessary, should be directed chiefly towards malaria control, even if this should entail the restriction of other public health activities, until malaria is no longer of major importance. As a rule, the physical debility and mental apathy of malaria-stricken peoples will not permit them to respond to a general public health programme, so that it is a logical procedure first to deal with malaria. On the other hand, where malaria is of minor importance, it may be dealt with adequately as part of an ordinary public health programme.

Thirdly, the Conference would like to emphasize the value of practical demonstrations of malaria control as a means of arousing the interest of lay (and even health) administrators. The lack of a good example of malaria control, well documented as regards statistics and costs, often explains official apathy and failure to appropriate funds for control programmes. The Conference recommends that, in countries where a malaria-control programme is poorly developed or is being projected for the first time, sufficient funds be allocated for at least five years to carry out a model project. This should include not only the controlled area, but also an equally carefully-studied area nearby in which

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...ried out, so that a contrast may be ...uch a demonstration control project with ...ast area has very great propaganda value, much ...re than a score of surveys barren of practical results.

In the fourth place, the Conference emphasizes the vital need for administrative co-operation between the health and other Government departments, such as Agriculture, Education, Finance, Forestry, Irrigation and Public Works. Further, the Conference recommends that, in the development of rural malaria control, the aid of such local bodies as co-operation societies, health leagues and rural improvement centres, should be enlisted and utilized to the fullest possible extent.

III. Cost of malaria control in rural tropics.—The Conference notes that, in many rural areas, the greatest obstacle in the way of malaria control is the fact that such measures as the use of oil, Paris green, or drainage, cost more money than the rural communities can raise. The Conference would point out carefully that it has been amply demonstrated that malaria control is to-day, as a rule, financially feasible in cities and large towns, communities of Government or industrial employees, military cantonments, constructional projects, colonization camps and pilgrimage centres, and wherever agriculture is organized into sugar haciendas, coffee estates, tea gardens, rubber plantations, oil-palm, casuarina or coconut groves, and similar ventures. In such places, it is lack or organization, not lack of money, which delays malaria control. Indeed, in many rural areas, deficiency in organization, rather than in funds, is the real difficulty.

The Conference recommends that, in formulating programmes for the control of rural malaria, administrators pay due regard to the above distinctions and, further, that they give rural districts as much aid from central funds as possible, particularly when the legal rights pertaining to streams, tanks or other malariogenic waters are under their direct jurisdiction.

Secondly, the Conference recommends that, in order to reduce control costs for rural communities, every effort be made (*a*) to extend the free distribution of cinchona products, (*b*) to enlist the aid of the people themselves in minor control methods, and (*c*) to explore cheaper methods of control which use time more than money. Persistence rather than perfection in control is required for rural areas.

IV. Naturalistic methods of malaria control.—The epidemiology of malaria is intimately associated with the adjustments and responses of malaria-carrying mosquitoes to their environment. The natural factors which determine whether or not water is malariogenic are numerous and often complicated, since they are dependent upon physical, chemical and biological conditions. The deliberate manipulation by man of one or more of these natural factors so as to prevent mosquito-breeding, to destroy larvæ, or even to deviate adult mosquitoes from man to animals, has come to be known as Naturalistic Control, and the Conference wishes to draw special attention to the possibilities of reducing malaria in this way.

Peasants can be taught such minor naturalistic methods as herbage packing with green-cut vegetation; fostering natural enemies such as fish; removing sheltering vegetation; shading breeding-places by cultivating certain plants or using coconut palm leaves, or woven bamboo mats, where the dangerous mosquito requires sunlight; periodical sluicing of small streams to eliminate mosquito breeding. Other naturalistic methods such as utilizing natural tendencies of rivers to deposit silt, or to flood or flush; making fresh water salty or *vice versa;* changing water levels; agitating surface water; automatic sluicing of larger streams—these usually require engineering skill.

The Conference recognizes that all of the above methods have been successfully applied in selected areas, and it urges that each country, not neglecting to use standard methods where feasible, investigate the possibilities of such cheap procedures. Up to the present, exact biochemical and microbiological observations have been so few that application of naturalistic methods has been largely empirical. The Conference emphasizes the need for reflective enquiry, so that naturalistic malaria control may be based more on reason than on authority. In the opinion of the Conference, great hope is offered for the control of rural malaria in selected areas by these naturalistic methods, which are relatively inexpensive and can suitably be carried out by the peasants themselves.

The Conference notes with satisfaction that the Health Committee of the League of Nations included in its plan of work for 1937–1939 the study of naturalistic methods of malaria control, a study which the Conference warmly recommends to workers in the East.

V. The effect of construction works on rural malaria.—Although in some Far Eastern countries a fair degree of co-operation has been developed between health officers and engineers for the avoidance of malaria, yet the amount of engineer-made malaria in other countries is appalling. Specifically, the Conference calls attention to malaria due to improper siting and housing; indiscriminate aggregation of labourers; uncontrolled jungle clearing; excavations such as borrow-pits, brick-fields and quarry-pits; obstruction of natural drainage by road, railway and canal embankments with culverts too few and too high; impounding of water without regard to leakages, seepages and raised water-table levels; irrigation without drainage.

Co-operation with the health authorities would obviate many of these unfortunate occurrences at little or no additional cost. In other instances, the expenditure of such additional sums as would be necessary to avoid the production of malaria would be justifiable, because it is almost invariably found that the cost of remedial measures is disproportionately greater than the extra initial outlay required to prevent malaria.

The Conference recommends, first, that every effort be made by lay administrators to secure close co-operation between their engineers and health officers; secondly, that appropriate legislation be enacted to prevent the creation of malariogenic nuisances by engineering departments or contractors under their supervision; thirdly, that in the budget of every constructional project in malarious places there be an item for malaria control; and, fourthly, that engineers be instructed in the fundamental principles of anti-malaria sanitation before assuming executive responsibilities in the tropics. In the opinion of the Conference, this end would best be achieved by special pre- and post-graduate courses of instruction and by suitable pamphlets for subsequent guidance.

VI. Relationship between rural malaria and the activities of the peasants.—It is well known that the amount of peasant-made malaria in rural areas is considerable. Specifically, the Conference draws attention to malariogenic 'wet cultivation' such as rice and sugar-cane; neglected side channels; leaky pumps; wells; uncontrolled jungle and mangrove clearance; various agricultural pits holding water; fish-ponds; mill-ponds; ruts; hoof prints; and buffalo-wallows; waste irrigation water; ill-kept drains. The Conference considers it important that attempts be made to develop agricultural technique which will tend to eliminate malaria-carrying mosquitoes and at the same time to improve crops. There is no evidence that the average peasant is interested, or can be aroused to sustained interest, in malaria control. He requires more tangible returns.

The Conference strongly recommends further research to the end that malaria control in rural areas, perhaps along naturalistic lines, may be interwoven eventually with agriculture, pisciculture and animal husbandry. The need for specially trained malarial agriculturists may perhaps be as great as for malarial engineers. Certainly, in rural areas there must be an attempt to fit malaria control methods to the needs, habits, capabilities, and resources of the peasants.

VII. Distribution of anti-malaria drugs.—The Conference is in agreement that the first responsibility of the Government in any malaria campaign is to save from death and relieve from physical distress the malarious sick by making anti-malarial treatment

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readily available. It subscribes, therefore, to the opinions expressed by the Malaria Commission of the League of Nations in its second report (1927) that the treatment of the malarious sick is the first step in any malaria policy and that 'wide distribution of quinine is a public duty which, whenever and wherever necessary, should be organized and paid for by the State'.

The Conference is also in agreement that, during malaria epidemics, it is the responsibility of a Central Government to make free treatment available to all; that, in ordinary times, where malaria is prevalent, free treatment should be provided for those who cannot pay. The Conference, further, is in agreement that the cinchona derivatives remain the drug of choice for mass distribution. While recognizing the usefulness of the new synthetic drugs in controlled therapy, the Conference is of the opinion that they cannot yet safely be placed in the hands of rural populations in Far Eastern countries. It wishes to call attention to the forthcoming report of the Malaria Commission of the League of Nations embodying the results of co-ordinated experiments with synthetic drugs on the treatment and prophylaxis of malaria in the field. This report was not available to the Conference.

The Conference recommends that every effort be made to widen the scope and cheapen the cost of mass distribution, especially of the less expensive totaquina and cinchona febrifuge. It realizes that the distribution of anti-malaria drugs at present is not so much malaria control as an alleviation of acute distress with reduction of mortality. Experience in many countries shows that the people can be induced to take just sufficient treatment to suppress symptoms even when the drug is given free.

The Conference recommends that health departments enlist the aid of Governmental or other reliable agencies in distributing cinchona products. When a special staff of dispensers is organized, the cost of distribution becomes a serious item. It is also suggested that any special programme for mass distribution be organized without supplanting the normal function of dispensaries. In certain restricted areas there might be considerable propaganda value in limiting the free distribution of anti-malaria drugs to those whose blood smears contain plasmodia.

VIII. Need for further research.—The Conference would like to emphasize a few special questions on which further research is urgently required in connection with the control of rural malaria. In the first place, while the systematic classification of anophelines is on a sound basis, there is a serious lack of information as to the bionomics even of those species known to be dangerous malaria carriers. Success in developing cheaper methods of naturalistic control must depend on a much fuller knowledge of the habits and intimate habitats of anophelines. This applies not only to anti-larval measures, but also to such potentially useful methods of attacking adult mosquitoes as insecticidal spraying.

In the second place, a much more definite understanding of the relationship between malaria, malnutrition, famine and poverty is required, as well as further elucidation of the factors concerned in malarial immunity, especially in so-called racial immunity.

In the third place, too little is known about the malaria parasite from the time it leaves the mosquito's proboscis until it appears in the peripheral blood. If this stage in the life history of plasmodia were known, it might be possible to accelerate research on the prevention of infection by drugs.

In the fourth place, a good deal more investigation is required to develop practical mosquito-nets for rural areas in the tropics, to forecast epidemics, and to make the use of zooprophylaxis practicable.

IX. Relation of malaria commission of the League of Nations to Far Eastern Countries.—The Conference desires to emphasize the value of the International Course in Malariology held at Singapore under the auspices of the Health Organization of the League of Nations.

It believes that only officers experienced in [illegible] commanding [illegible] publicity, [illegible] some [illegible] work should, for preference, be sent to this course. It also believes that the Health Committee might consider the possibility of giving a concurrent course for anti-malaria engineers at the same time and place. It further suggests the possibility of having a week's round table conference each year in which members of the League Malaria Commission from the East might usefully take part, for the dual purpose of advising the Malaria Commission on studies and problems in the East, and of comparing the conclusions of any investigations undertaken by or through them on behalf of the League.

The Conference welcomes the proposal, under the Health Committee's three-year plan, for the Malaria Commission to consider the advisability of holding, not earlier than 1939, an Inter-Governmental Conference on Anti-malaria Drugs, which would examine the following problems: present production as compared with world requirements, cost of production and market prices; relative costs of a plan of co-ordinated measures of treatment and prevention by the administration of drugs; methods of distribution.

Plague

1. Since the tendency of pandemic plague to diminish in some parts of the world is offset by the possibility of its development elsewhere, and since, moreover, there is a growing danger of the dissemination of plague through the agency of modern communications, which are rapidly increasing throughout the world, the rural plague problem remains of great importance. It is therefore incumbent upon the Governments concerned to maintain the strictest vigilance by keeping their health services and permanent anti-plague organizations adequately provided with the necessary material and personnel.

2. In addition to the recognized methods of preventing the outbreak and spread of plague, such as rat-proofing of ships and buildings, the attention of the Advisory Council of the Eastern Bureau at Singapore should be drawn to the need for applying measures of control to rail, motor and other forms of land transport.

3. Apart from the destruction of rats (and rat fleas) by trapping, poisoning, fumigation, etc., the Conference emphasizes the necessity for improvement of existing dwellings and for the construction of new houses based upon rat-proof designs. The Conference recommends that Governments forward to the League Eastern Bureau at Singapore, for distribution to other administrations, any plans and designs they may approve from time to time. The Netherlands Indies Government has set an excellent example with its improved bamboo dwellings, and similar principles may be applied in communities where timber, mud, straw and the like are utilized.

4. (*a*) The Conference strongly recommends that mass vaccination be widely adopted in plague-infected areas and that statistical data be carefully compiled on a uniform basis.

(*b*) In view of the encouraging results obtained in Java by the use of a non-virulent live vaccine, it is strongly recommended that any country carrying out similar work should use a strain duly approved in respect of its antigenic power, and should apply the standard technique.

(*c*) At the same time it is desirable to collect further statistical data regarding the results obtained with heat-killed vaccine.

5. For all the purposes set forth in 4 (*a*), (*b*) and (*c*) above an exchange of technical information between the institutes concerned would be of great advantage.

Ankylostomiasis

The Conference recommends the following measures for the combating of ankylostomiasis, in addition to general educational and hygienic measures:—

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...—(*a*) Mass treatment and re-treatment ...iven only to population groups in which ...ul effects resulting from the infestation are clearly ...scernible.

(*b*) Individual treatment should be given as a matter of course to all persons on admission to a hospital or an institution in which such treatment can be given as part of the general routine.

II. Prophylaxis.—(*a*) Prevention of soil infestation being of paramount importance, the extensive building of latrines, if possible one to every house, seems to be the only permanent method of control. Governments should give assistance to further the building of latrines; their use should be encouraged by propaganda.

(*b*) More attention should be directed to the possibility of influencing the diet of tropical populations with the object of ensuring a sufficient intake of iron. Emphasis may perhaps be placed on iron contained in animal foods.

Tuberculosis

1. In the anti-tuberculosis campaign in Asia, the greatest attention must be paid to the improvement of health by indirect methods, among these the raising of the standard of living with consequent improvement in physical and mental development is of outstanding importance.

2. A thorough study of the influence of nutrition is essential.

3. As regards the direct attack on the disease, a beginning should be made with a modest programme. The most effective plan is the gradual establishment and extension of a network of dispensaries co-operating with other Public Health agencies. These dispensaries, which should include the provision of some treatment among their functions, would furnish data regarding detection of early cases, family infection, school-inspection, house-visits, general hygienic education, etc., which would be of value for purposes of preventive medicine.

4. Anti-tuberculosis associations or voluntary organizations are of great value in stimulating public interest in tuberculosis as well as in attacking the social and economic problems connected with this disease: for example, assisting tuberculosis patients to obtain an adequate diet, suitable living accommodation and employment or temporary financial relief.

5. Although for economic reasons the system of sanatorium treatment cannot be as extensive as in Europe, it is desirable that sanatoria of a simple type should be set up in numbers appropriate to the development of the dispensary system.

6. Apart from these, it is desirable to establish a few fully-equipped sanatoria serving as centres for post-graduate work on tuberculosis and as central training institutes for auxiliary personnel; in these sanatoria, the general system to be applied in the treatment of tuberculosis may be worked out. In countries with restricted budgets, the beds occupied by very advanced cases in public hospitals can with greater advantage be used for other patients. Facilities for the cheaper institutional accommodation of such advanced cases should therefore be provided.

7. It is essential that, in Asiatic countries, complete and accurate data should be collected regarding the incidence and severity of tuberculosis.

8. Tuberculin tests and the method of appraisal of results should so far as possible be standardized on an international basis. Attention may be drawn to the method used for tuberculin tests in the Netherlands Indies.

9. Tuberculosis surveys may be carried out in villages to determine the incidence of the disease and the source of fresh infections.

10. The Conference strongly recommends that plans for a campaign against tuberculosis and schemes be drawn up, and carried out, in so far as resources permit, by the Governments of all countries in the East.

The Conference further recommends that, when such plans have been worked out, they should be sent to the Eastern Bureau of the League of Nations at Singapore for communication to the other administrations. The question could be placed upon the agenda of the annual session of the Eastern Bureau Advisory Council in 1939.

REPORT ON THE PUBLIC HEALTH ADMINISTRATION OF BURMA FOR THE YEAR 1936, INCLUDING ADMINISTRATION OF VACCINATION IN 1936-37

The chief diseases in Burma and their epidemiology

Cholera.—Cholera was not widespread in the country. The death rate shows a drop of 0.49 compared with the previous year and 0.08 compared with the five-year mean. In the first five months of the year the disease was mostly confined to four districts in the Tenasserim division, where it continued from the previous year. In June and July there was a rise in the incidence of this disease in the Irrawaddy and Pegu divisions. Thereafter only stray cases were reported.

Anti-cholera measures.—On receipt of the news of an outbreak, the epidemic staff in the district is augmented, if necessary, and instructions are issued for the performance of intensive anti-cholera inoculation and for the purification of water supplies. Propaganda is also carried out to make these measures popular. The people have begun to appreciate the benefit of anti-cholera inoculation. As the cholera epidemic during the year was not very severe, the number of inoculations performed fell from 576,216 in 1935 to 206,608 this year. The districts in which the largest number of inoculations were performed are Thaton 31,685, Myaungmya 31,640 and Maubin 27,183.

Smallpox.—The death rate from smallpox is 0.01 in excess of the previous year but is 0.01 below the five-year mean. As usual the disease was most prevalent during the period March to May, while the lowest number of deaths was recorded in September. With the exception of Kyaukpyu, Minbu, Pakôkku and Sagaing, mortality was reported from all districts. Of the 1,354 deaths during the year 8.20 per cent were among children under one year, 21.71 per cent among children over one and under ten years and the balance of 70.09 per cent were among persons over ten years. These figures reveal the necessity for revaccination among adults, especially in the rural areas.

Plague 0.19.—The death rate from plague this year is 0.08 below the previous year and 0.06 less than the five-year mean. As usual, the disease was most prevalent in the cold weather, *i.e.*, January to March, November and December. The lowest mortality was recorded in the month of May. The Arakan division and the districts of Tavoy and Mergui were, as in previous years, free from the disease and five other districts returned no mortality from this cause during this year.

Anti-plague measures: (*a*) *Rat destruction.*—The total number of rats killed by trapping and smoking was 834,551 (840,576). As in previous years the vast majority, *viz*, 753,618, were reported as killed in the Rangoon Corporation area. Other towns in which rat destruction was carried out were Moulmein 10,933, Syriam 8,856, Myaungmya 5,667, Bassein 5,067 and Myingyan 4,296. In the rural areas rat destruction was reported from Insein, Myaungmya, Magwe, Mandalay and Sagaing districts.

Fumigation of rat holes with cyanogas has become an established method for keeping down the rat population in any area. The reports received from districts and towns in the country indicate that its use has become universal. Unfortunately many of the reports do not give detailed statistics of the number of rat holes cyanogassed and the number of connecting holes blocked. In Mandalay town, where cyanogas work is done thoroughly and systematically, 157,363 premises were inspected for the presence of rats; of these 16,832 were found to have rat holes. The number of rat holes treated with cyanogas during the year was 39,331 and the number of connecting holes blocked was 89,234.

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(*b*) *Inoculation.*—During the year 171,041 persons (125,079) were protected with anti-plague inoculation. Of this year's total 77,947 were done in the rural areas and 93,094 in towns.

Fevers (provincial).—The death rate from fevers (8.67) has shown a rise of 1.36 compared with the previous year and is 1.74 in excess of the five-year mean. This group accounted for 39.71 per cent of the total mortality. A large proportion of the fevers is undoubtedly due to malaria. The largest number of deaths was recorded in the month of December in which month is also recorded the largest number of deaths from malaria in towns. The lowest number of deaths was in May.

Enteric fever.—The death rate (0.24) is 0.02 in excess of both the previous year and the five-year mean. The highest rates during the year were reported from Yandoon 1.51, Myitkyina 0.82, Mandalay 0.80 and Bhamo 0.75. It is considered that the total deaths reported due to enteric do not represent the true incidence; this is due to the comparative rarity of accurate bacteriological investigation into cases.

Dysentery and diarrhœa.—The death rate from this group of diseases (0.48) shows a decrease of 0.05 compared with the previous year but it is still 0.02 in excess of the five-year mean. The highest mortality was, as usual, recorded in July and the lowest in March.

Respiratory diseases.—There was an increase of 0.16 in the death rate from these diseases (1.15), compared with the previous year and 0.14 compared with the five-year mean. The lowest number of deaths was recorded in the month of May. In the other months figures of mortality were more or less evenly distributed, the highest number having been recorded in September. As usual, there was a marked preponderance of male over female deaths, the proportion being 138 : 100.

Beri-beri.—This disease is not notifiable in the rural areas and so its incidence can only be gauged from information contained in the annual public health and other special reports from the District Health Officers. In the *Upper Chindwin* it would appear to occur usually from October to March. It was specially noticeable among the employees of the Bombay-Burmah Trading Corporation, Ltd., though cases were also met with among the villagers. The Company substituted the supply of *atta* for rice to their employees and had all cases treated in hospital. In *Toungoo* district the disease continued to be fairly common among mahouts working in timber camps, while, as in the previous year, in *Pyapôn* it was confined to Indian coolies, whose low standard of living renders them liable to be attacked.

Goitre.—This disease is endemic in the Shan States, Bhamo, Upper Chindwin, Katha and Pakôkku districts. It is also prevalent in the districts of Henzada, Toungoo, Salween and Minbu. In the Kêngtüng subdivision, Southern Shan States, it is very commonly found but the inhabitants there seldom go to hospital for treatment. In the Northern Shan States, Namhsan and Kutkai recorded the highest incidence and during the year 8,659 (6,673) cases were treated in hospitals. In the Chin Hills a certain kind of locally manufactured salt is popularly believed to be a cure for goitre. A sample of this salt was analysed by the chemical examiner, Rangoon, and was found, after purification, to be nearly 92 per cent sodium chloride with some traces of alkaline compounds. It contained no iodine.

Yaws.—This is known to be endemic in Victoria Point subdivision, Bokpyin township and elsewhere in the interior of Tenasserim and Palaw townships in *Mergui* district. It occurs most frequently among the Salons, Malays and Siamese but is also found among Burmans and Karens. During the year a sub-assistant surgeon of the medical department was deputed to carry out during the open season a survey and treatment of cases in Tenasserim, Palaw and Mergui townships. The district council agreed to meet the incidental charges of the survey, the pay of the sub-assistant surgeon was met from provincial funds and the cost of the drugs was borne by the Burma Red Cross Society. During the period from [illegible] commanding 327 cases were treated in 20 different villages. [illegible] publicity. [illegible] some treatment of yaws in Victoria Point subdivision. [illegible] assistant surgeon attached to the Civil Hospital, Victoria Point, was ordered to visit the villages in the subdivision occasionally. The District Council's Local Fund in this connection paid the travelling allowance of one interpreter and the cost of drugs and other incidental charges. Yaws appears to be prevalent in the *Lower Chindwin* district, more particularly in Kani township. During the year a few cases were reported from Yinmabin and Budalin townships. The district health officer has applied to the Burma Red Cross Society for a grant to intensify the campaign against this disease. In the *Upper Chindwin* district the disease is believed to be common in several townships. Unfortunately many cases were not reported to hospital as the villagers do not appreciate that the cure is easy. A sum of Rs. 100 was expended on drugs from the Deputy Commissioner's Local Fund and the District Health Officer is submitting proposals to the Inspector-General of Civil Hospitals for the posting of a sub-assistant surgeon for three months to tour in the infected villages and give treatment by injection. It is hoped that sufficient funds will be available for the purchase of drugs in the ensuing year. In *Kyauksè* district yaws is present in Myittha and Sagaing townships. In the past only sporadic efforts have been made to deal with it but the District Council is now being requested to allot some money for treatment of cases. In *Mogôk* subdivision the disease was prevalent in the villages of Letpangon, Sezingon and Zegon and a few people turned up for treatment at the Civil Hospital at Thabeitkyin.

Leprosy.—This disease is only notifiable in two municipalities, namely, Maymyo and Mônywa; in other towns figures of mortality alone are available. During the year 1936, there were 292 deaths from leprosy in towns which gives a death rate of 0.21. The largest number of deaths were recorded in Rangoon and Mandalay, probably because the asylums for the compulsory segregation of pauper lepers exist in these two places. During the year there were three leper colonies in Burma situated at Mônywa, Minbu and Kêngtüng (Southern Shan States). The colonies at Mônywa and Minbu are controlled by non-official local Leprosy Relief Committees while the one at Kêngtüng is run by the Roman Catholic Mission. To all these colonies clinics are attached in which leper patients, both in-door and out-door, are treated by specially trained doctors on specified days each week. In the Mônywa colony there were at the end of the year 87 (77) inmates. The existing accommodation, consisting of seven cottages each housing eight patients, having proved inadequate to meet the growing demand, four new cottages were built. Excellent work is being carried out at this colony. The number of patients in Minbu colony at the close of the year was 38. There are in all five cottages, one having been added during the year for the accommodation of additional in-patients. Kêngtüng colony had 105 resident lepers at the end of the year, this includes six children. All these colonies receive grants from the Burma Branch of the British Empire Leprosy Relief Association. Plans for the colony at Meiktila have progressed during the year. A piece of land measuring 10 acres has been acquired and a cottage for the accommodation of eight patients has been completed. A brick building, the expense of which has been met by a local philanthropist, is being constructed for use as a clinic and store-room. Water is available from an excellent well situated on the colony site. It is probable that this colony will be inaugurated before this report is printed.

In the absence of colonies we have to fall back on the establishment of clinics in attempting to combat this disease. But there is no doubt that the establishment of clinics does not do away with the necessity for colonies. The economic and physical difficulties experienced by people in attempting to attend at clinics are frequently insurmountable. Clinics for the treatment of lepers should have as their main object the

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...n and confidence of those suffer-...ase. Cases should be followed up to ...contacts should be examined and the ...of the disease in the village locality be thus ...ked out. Cases should be listed so as to distinguish between infectious and non-infectious types and the final object should never be forgotten, *i.e.*, the effective isolation of all infectious cases from the community and especially from children, as the latter are so highly susceptible to infection. The ultimate aim should be the founding of communities forming leper villages in which the more able-bodied can help those less strong.

During the year six alien lepers are reported to have entered Burma through Rangoon, of whom one was sent to the leper asylum and the others were allowed to go to their residences.

Venereal diseases.—The general opinion among district health officers is that the incidence of this group of diseases is very high. Unfortunately they are not taken seriously in many of the districts. Much propaganda is needed to impress upon people the seriousness of these complaints and the importance of avoiding them in the interests of the generations yet to come. During the year, 320 deaths from syphilis and 15 from gonorrhœa were recorded in towns. These figures do not, however, give an accurate idea as to the extent of prevalence of this group of diseases. In the Rangoon General Hospital out of 796 post-mortem examinations carried out in 1936 signs of syphilis were detected in 15.58 (21.24) per cent, the corresponding percentages for 1934 and 1933 being 20.99 and 19.75 respectively. Among the 2,038 admissions into the four shelters of the maternity and infant welfare society, Rangoon, venereal infection was traced in 341 cases.

Rural health unit, Hlègu.—This health unit was started in the year 1929 with the idea of demonstrating to the people in a typical rural area what can be done to improve sanitary conditions by applying modern methods of public health, employing a personnel and equipment on a scale comparable with such services as police protection and general education. As in previous years the collection and study of vital statistics, control of acute epidemic diseases, health education, maternity and child welfare work, medical examination of school children, hookworm survey, waste removal, improvement of food establishments and water supplies, soil sanitation and laboratory work constituted the unit's main activities.

Improvement of environmental sanitation constituted one of the main functions of the unit. During the year 738 wells and tanks were inspected and as a result of the inspections 38 wells and 13 tanks were improved and 27 wells and 3 tanks were chlorinated. Food stalls, cattle-sheds and other premises inspected totalled 3,253. Additional bored-hole latrines numbering 262 were installed in 12 villages and the total number of bored-hole latrines in the unit area is now 2,087. Refuse removal was carried out with the Unit's lorry at Hlègu and Dabein where 1,370 loads of refuse were removed to the dumping grounds. Anti-rat measures were carried out systematically; 349 rat holes were fumigated with cyanogas, 1,193 connecting holes were blocked and 299 other rat holes were smoked; 6,030 rats were also trapped and destroyed.

Malaria.—It is very difficult to arrive at an actual estimate of the incidence of malaria in rural areas as village headmen, who act as death registrars in these areas, are apt to classify any rise of temperature as due to malaria. During the year 100,395 out of the 220,846 deaths in the rural areas were ascribed to fevers. It is believed that a fair estimate is that half the deaths described as fevers should be ascribed to malaria.

The urban death rate was 0.26 higher than the previous year and 0.18 in excess of the five-year mean.

Cinchona febrifuge and quinine tablets.—During the year the manufacture of cinchona febrifuge tablets for the replenishment of stocks in district treasuries was continued in Rangoon Jail. This drug is either issued free in necessitous cases, or is supplied to retail licensed vendors to sell to the public. During the year treasuries sold 3,554,100 tablets (3,826,980). The largest decrease was shown in the Southern Shan States—719,820 and two other districts which showed a notable fall in sales were Northern Shan States—54,540 and Pyapôn—30,780. Increases in sales were returned from 24 districts, notably in Toungoo + 143,100, Pegu + 65,880, Minbu + 52,020 and Myitkyina + 51,480.

During the year 5,000 lbs. of quinine sulphate were received for free distribution from the Government of India. When making this supply the Government of India stipulated that this Government's allotment for the purchase of cinchona febrifuge tablets should not be reduced in the next three years. A provision of Rs. 22,500 was made for the purchase of cinchona febrifuge tablets for free distribution from the grant made by the Government of India for rural improvement work. These two grants made available a large quantity of quinine sulphate and cinchona febrifuge for wide and systematic free distribution. In order that there should be no confusion between the existing scheme for distributing this drug through district treasuries with the scheme for free distribution made possible by the two grants mentioned above, arrangements were drawn up for the distribution through district health officers of the free quinine and cinchona febrifuge purchased from the grant. It was realized that the task of distribution in the rural areas was beyond the limited public health staff and the co-operation of many other departments was asked for and obtained in distributing these drugs. The scheme was inaugurated in August during the year in the 40 districts of Burma, excluding Rangoon, and 2,540,610 tablets were distributed free. The largest distribution was made in the districts of Minbu 270,000, Hanthawaddy 231,840, Shwebo 214,560 and Yamèthin 181,854. That the scheme is a success and has been worked energetically is shown by the fact that by the end of the year over 4,000 lbs. of quinine sulphate had been converted into tablets and supplied to district health officers. Besides this distribution of quinine sulphate tablets, a total of 298,800 cinchona febrifuge tablets were distributed from treasuries in 13 districts.

The result of this was that the average consumption of quinine and cinchona febrifuge per head of population this year rose from 1.20 grains in 1935 to 1.79. There is no doubt that this increase was mainly due to the expensive free distribution of quinine sulphate.

Maternity work.—As in the previous year, 34 midwives were employed by 11 voluntary child welfare societies for maternity work and they attended 5,807 (6,095) confinements. Local bodies such as municipalities, district councils and Deputy Commissioners' local funds employed 203 midwives and they attended 20,531 (19,447) confinements. The percentage of births attended by these midwives in urban areas is 29.50, while the corresponding figure for the rural areas is only 2.88. Details are not available as to the number of confinements attended by private doctors and private midwives in urban and rural areas. During the year statistics as to the extent to which mothers availed themselves of skilled midwifery service were collected in 13 towns having wholetime health officers. These statistics reveal that of the total births in these towns 19.55 per cent were attended by municipal midwives and midwives employed by child welfare societies; 5.88 per cent by private midwives; 2.52 per cent by private practitioners; 19.89 per cent in hospitals and 49.71 per cent by untrained midwives, the balance of 2.45 per cent being unattended. The provision of skilled midwifery service in the rural areas is very inadequate and its development is bound to be slow.

Child welfare work.—The only child welfare work in Burma which is not undertaken by voluntary child welfare societies is that of the Rangoon Corporation and the Rural Health Unit, Hlègu.

The total number of child welfare societies in Burma in 1936 was 47. Of these, 28 societies conducted 32 child welfare centres, thirteen of them employing trained health visitors, and eleven employing a nurse or midwife for child welfare work. The remaining four

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societies relied on voluntary workers. Four new societies were formed during the year.

ANNUAL REPORT ON THE WORKING OF THE CIVIL HOSPITALS AND DISPENSARIES IN THE MADRAS PRESIDENCY FOR THE YEAR 1936

At the beginning of the year under report there were 1,363 medical institutions of which 1,116 were in rural areas and 247 in urban areas. Forty-nine new dispensaries were opened during the year, eighteen closed and thirty transferred to other classes of institutions. Thus at the end of the year there were 1,364 medical institutions (1,118 and 246 in rural and urban areas respectively) at work in the Presidency, *i.e.*, State public 191, State special 28, local and municipal funds 517, private-aided 67, private non-aided 94, railways 48 and subsidized rural 419.

(*a*) *In-door patients.*—The total number of patients treated in all classes of medical institutions during the year was 255,358 (130,945 males, 103,696 females and 20,717 children) as against 245,590 (129,661 males, 97,261 females and 18,668 children) in 1935 showing an increase of 3.98 per cent over the number treated in 1935.

(*b*) *Deaths.*—There were 12,182 deaths in all the medical institutions during the year. The ratio of deaths per cent to total treated for the last five years have been as follows:—

1932	..	..	4.39
1933	..	..	4.72
1934	..	..	4.89
1935	..	..	5.03
1936	..	..	4.77

(*c*) *Daily average attendance of in-patients.*—The daily average attendance of in-patients during 1936 in the Presidency was 11,656.03 as against 11,244.20 in the previous year. The increase per cent was 3.66.

(*d*) *Beds.*—The beds provided for in-door patients in hospitals of classes I, III and IV were 10,986 (6,205 men and 4,781 women) in 1936. The need for additional beds was keenly felt in many of the hospitals during the year.

(*e*) *Out-door patients.*—In all classes of medical institutions 16,032,812 patients were treated consisting of 7,482,765 males, 4,022,425 females and 4,527,622 children as against 16,570,958 (7,788,602 males, 4,015,155 females and 4,767,201 children) in the previous year.

(*f*) *Daily average.*—The daily average number of in- and out-door patients treated in medical institutions of classes I, III, IV and VII during the year was 11,656.03 and 109,226.04 respectively while the same during the previous year was 11,244.20 and 112,479.96 respectively.

The following diseases treated among in- and out-door patients in all the medical institutions in the Presidency during the year accounted for the largest number:—

Diseases of the respiratory system other than pneumonia and tuberculosis ..	1,235,295
Diseases of the digestive system ..	1,192,351
Diseases of the eye	1,169,367
Ulcerative inflammation	1,138,544
Diseases of the ear	1,124,431
Malaria	999,612
Diseases of the skin excluding tumours	859,021
Scabies	778,461
Diseases of the intestines	740,301
Pyrexia of uncertain origin due to infection	718,102

Tuberculosis.—The number of patients treated for tuberculosis (tuberculosis of the lung and other tuberculous diseases) in all the medical institutions was 75,279 during the year under report. The deaths were only 1,017 as compared to 1,413 of last year. The Tuberculosis Institute has continued to serve as a centre for after-treatment of cases discharged from commanding culosis Hospital, Madras, and other [illegible] publicity. sanatoria in and outside the Presidency. [illegible] some step in anti-tuberculosis work in Madras [illegible] tuberculosis clinic on up-to-date lines has been start[illegible] for the examination of contacts, by the tuberculosis sub-committee of the King George V Thanksgiving (Anti-Tuberculosis) Fund, Indian Red Cross Society, as an adjunct to the Tuberculosis Institute, Egmore, and it is working successfully since last year. With a view to providing more accommodation and treatment for such cases, the Government have taken over Dr. Muthu's Sanatorium at Tambaram in Chingleput district. The Coimbatore District Tuberculosis Sanatorium Society has taken steps to establish and maintain a sanatorium at Perundurai. A tuberculosis clinic has been opened at the Government Victoria Caste and Gosha Hospital, Triplicane, as an experimental measure for one year. Observation of the employees of the Government Press continued as usual at the institute. Of the 26 cases sent to the institute for observation, 12 were found to have tuberculosis. Owing to the large demand for admission among patients suitable for hospital treatment, temporary arrangements have been made to provide more beds in the recreation and dining-hall of the hospital. The need for more accommodation for cases of tuberculosis is very great. Some thousands of beds in hospitals and sanatoria and tuberculosis clinics are required.

Leprosy.—The number of leprosy clinics functioning at the end of the year was 445 wherein about 70,000 injections are given every month. Several Government and local fund medical institutions in the Presidency have leprosy clinics attached to them. The purpose of leprosy clinics is to bring treatment within easy reach of every affected individual and the necessity for erection of separate leprosy sheds was keenly felt in many clinics where the attendance was high. With a grant-in-aid from the Silver Jubilee Fund, special clinics for the study of leprosy and its epidemiology will soon be established at Rayapuram, Saidapet, Vellore, Cuddalore and Tanuku. The Silver Jubilee committee have sanctioned grants to provide increased accommodation in the leper asylums at Salur, Kodur, Narsapur, Bapatla, Chingleput, Kumbakonam, Manamadura and Mangalore. It is now necessary to carry on the work with greater efficiency and to organize special investigation units for intensive study of the disease particularly in children.

SEVENTY-FIFTH ANNUAL REPORT OF THE GOVERNMENT CINCHONA PLANTATIONS AND FACTORY IN BENGAL FOR THE YEAR 1936-37

The market price for cinchona products has again suffered no major change during the year under review, for quinine has been firmly held and remains securely linked with gold. Even the violent fluctuations of currency have failed to affect it, a rise of an anna an ounce being the limit of the change recorded. The steadiness of the position reflects the strength and foresight of those who negotiated the quinine agreements, while the apparent determination to maintain prices at a level commensurate at once with demand and with the costs of production may be taken as the best indication of the future stability of the industry. For there is as yet no sign of production outside Java on a scale or at a cost likely to affect the monopoly secured. That it is in parts of India cheaper to grow than to buy quinine has as yet no visible effect on prices for it is not unknown that the volume of production here is, and for years to come will be, insufficient to disturb the market. If proof of this were needed one might refer to the fact that it has not been a fall but a rise in price that has accompanied the placing in the market of considerable quantities of Government quinine.

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Service Notes

Appointments and Transfers

Major-General P. S. Mills, C.I.E., is appointed Honorary Physician to the King, dated 29th March, 1938, *vice* Major-General D. P. Goil, retired.

Colonel D. H. Rai, Inspector-General of Civil Hospitals, C. P. and Berar, ceased to be Officiating Director of Public Health, C. P. and Berar, in addition to his own duties from 19th August, 1938.

Lieutenant-Colonel S. N. Makand returned from leave and resumed charge of the office of Director of Public Health, C. P. and Berar, from 19th August, 1938.

Lieutenant-Colonel T. C. Boyd, on the expiry of his leave, is reappointed to be Principal, Medical College, and Superintendent, Medical College Hospitals, Calcutta, *vice* Dr. Dabiruddin Ahmed.

The dates of the appointment of the undermentioned officers to the Civil Branch of the Indian Medical Service are as now shown against their names:—

Lieutenant-Colonel D. L. Graham. Dated 7th August, 1925.

Lieutenant-Colonel C. H. P. Allen. Dated 24th February, 1927.

Lieutenant-Colonel E. R. Daboo. Dated 9th October, 1928.

Lieutenant-Colonel J. L. Sen. Dated 13th July, 1925.

Major R. A. Haythornthwaite. Dated 26th March, 1936.

Major J. L. Donnelly. Dated 2nd July, 1935.

Major W. J. L. Neal. Dated 18th July, 1935.

Major J. A. W. Ebden on return from leave to rejoin the appointment as Principal and Professor of Surgery, Medical College, Vizagapatam, and First Surgeon, King George Hospital, Vizagapatam, and Chief Medical Officer, Vizagapatam Port.

Subject to the approval of the Secretary of State for India to the transfer of Major Jaswant Singh to the Civil Branch of the Indian Medical Service, that officer is appointed to the Medical Research Department on probation for 2 years, with effect from the 11th July, 1938 (afternoon), and is placed on foreign service under the Indian Research Fund Association.

Major D. Kelly returned from leave and resumed charge of the office of Civil Surgeon, Raipur, from 8th August, 1938.

Captain M. Sendak, who was attached to the office of the Civil Surgeon, Nagpur, for training, has been posted as Civil Surgeon, Saugor, where he assumed charge on the afternoon of 17th August, 1938.

Captain V. E. M. Lee, Civil Surgeon, Saugor, has been reverted to Military duty. He was relieved of his Civil duties in this province on the afternoon of 17th August, 1938.

Leave

Lieutenant-Colonel N. S. Jatar has been granted an extension of leave by 1 month and 6 days.

Lieutenant-Colonel T. H. Thomas, Officiating Professor of Medicine, Medical College, Calcutta, is granted leave for the period from the 2nd August, 1938, to the 1st September, 1939, in extension of the leave already granted to him previously.

Major K. S. Fitch, Civil Surgeon, Hooghly, is granted leave for 2 months, in extension of the leave already granted to him previously.

Major G. M. Irvine was granted 5 months and 28 days' leave on medical certificate, including 1 month and 1 day vacation, with effect from the 1st August, 1938.

Captain R. L. Raymond was granted 1 year's leave, with effect from the 31st August, 1938.

Promotion

Captain to be Major (probationary)

A. K. Gupta. Dated 15th July, 1938.

Relinquishment

Captain A. G. Khan (S. S.) relinquishes his commission on the ground of ill health. Dated 26th August, 1938.

Lieutenant A. A. Khan relinquishes his temporary commission. Dated 5th September, 1937.

Retirement

Lieutenant-Colonel S. S. Vazifdar is permitted to retire from service, with effect from 1st August, 1938.

Lieutenant-Colonel J. A. Sinton, V.C., O.B.E., retires. Dated 4th August, 1938.

Lieutenant-Colonel B. H. Kamakaka, M.C., retires. Dated 22nd August, 1938.

Notes

BRITISH MEDICAL ASSOCIATION EXHIBITION, PLYMOUTH

18th to 22nd July, 1938

The extensive display of fine pharmaceutical products shown by Burroughs Wellcome and Co. bore witness to the steadily progressive policy of the firm, several recent introductions being exceptionally noteworthy.

Much interest was manifested in 'Tabloid' brand Sulphonamide-P, the sulphanilamide preparation for oral administration, which is rapidly increasing in importance as its therapeutic value gains greater recognition. In an ingenious arrangement of illuminated photo-micrographic transparencies, the specific chemotherapeutic effect of sulphanilamide upon the hæmolytic streptococcus was beautifully demonstrated. In addition, the clinical use of sulphanilamide in such conditions as meningococcal meningitis and *B. coli*, *Pr. ammoniæ* and gonococcal infections of the genito-urinary tract was shown pictorially, other indications being also mentioned.

Another important exhibit was 'Wellcome' brand insulin—a product prepared with pure crystalline insulin—together with 'Wellcome' brand protamine insulin (with zinc) suspension, which, because of its prolonged blood-sugar-lowering effect, is being increasingly used as an alternative to or in conjunction with unmodified insulin.

A notable introduction which aroused considerable interest was 'Wellcome' brand calcium mandelate compound, for use in urinary tract infections. This preparation lacks the disagreeable taste characteristic of sodium or ammonium mandelate, and possesses a ready miscibility, two advantages making greatly for ease in administration.

Specimens of 'Tabloid' brand nicotinic acid, a product which has been introduced for the treatment of pellagra, were noted with interest.

VIROL AND SCHOOL CHILDREN

The Lord Luke, K.B.E., speaking at the 38th Annual General Meeting of Virol, Limited, said the public's attention had no doubt been attracted to the growing importance of investigation into the problem of nutrition; knowledge in this field had extended so rapidly that manufacturers of food preparations of a specialized character found it essential to maintain continual research. Modern discoveries had made the science of nutrition so complex that it was exceedingly difficult for the medical profession to evaluate the relative merits of the food preparations available, except by the fundamental test of direct experiment, under similar conditions to those prevailing in the intended field of application. Virol, Limited, had always recognized the need for such work, and reference was made in the report to the publication in October last of an important investigation into 'The Supplementary Feeding of School Children'. These researches were carried out on 864 children attending schools in the North and South of England.

Their growth-rates while on ordinary meals only were compared with their growth-rates when receiving

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in addition a ration of one of three supplements normally used in schools, one of which was Virol. The results indicate the necessity of such supplementary feeding, and the superiority of Virol over the other two supplements. They also afford remarkable confirmation of the findings of the previous investigation on children of pre-school age.

BRITISH FUND FOR RELIEF IN CHINA

Dr. Bernard E. Read, acting director, Henry Lester Institute of Medical Research, Shanghai, writes:—

'There have been received through the British Fund for Relief in China twenty hundredweights of marmite, which have been distributed to Canton, Kunming, Hankow, Shanghai and Tientsin, about half of it going to Hankow and West China.

In Shanghai the disease incidence among the refugee population of about 200,000 has been estimated to be about 10 per cent. Of these about one-tenth have suffered from beri-beri, which does not include other types of general malnutrition. These 2,000 cases of beri-beri often suffered from multiple dietary deficiencies such as avitaminosis A and B_2 as manifested by the extensive amount of skin disease.

The supplies of marmite sent out to China have been of great value in the treatment of beri-beri. The high content of vitamin B in marmite together with the other extractives from yeast provided a valuable remedy for the cases of multiple dietary deficiency. The severe cases were given one ounce a day and the milder cases half an ounce, producing the expected result of a complete cure of the beri-beri cases of the dry type.

General deficiency disease has been too extensive for the limited supplies of marmite to be used for anything but therapeutic purposes along the lines indicated. The highly organized medical service in Shanghai has enabled us to use the marmite in the most effective way possible, in the treatment of sick people from the refugee camps.

At one time it was proposed to distribute it as a general nutritive to certain undernourished camps, with the view of observing its general beneficial value. But the constantly shifting character of the population in the camps, and the huge amount required, rendered this impossible.

We send our very grateful thanks for this valuable gift which has proven of such service to us in Shanghai.

It has been impossible with all the difficulties of communication to obtain at this juncture detailed reports from other centres. One consignment was sent to Hangchow for the treatment of beri-beri cases, and others who have used this marmite have expressed great appreciation of such a valuable gift. It has brought relief to thousands and saved from death many in the crowds of homeless, penniless, sick and starving refugees'.

PACKAGING PROGRESS

Pharmaceutical Specialities (May and Baker) Limited, of Dagenham, for many years have marketed the majority of their well-known preparations in tubes and glass bottles, enclosed in boxes, but these will now for the most part disappear from the pharmacy shelves to be replaced by aluminium containers in cardboard cartons.

Courage, as well as initiative, is needed to introduce a change by which an old and familiar packing, which has come to be regarded by chemists and medical men as a symbol of quality and purity, is abandoned in favour of an entirely new type which has still to make itself known, and even firms which succeed, by constant research, in maintaining their products in the van of scientific progress, may be excused for a somewhat conservative attitude towards their packings. But progressive improvement in design and materials necessitates periodic revision of packing methods if an anachronistic appearance is to be avoided and Pharmaceutical Specialities are acting wisely in taking this step.

The superiority of the new pac[illegible] commanding no means based solely on their [illegible] publicity. aluminium containers are light and easy [illegible] Their circular base gives them greater stability th[illegible] easily overturned bottles, whilst the convenient scr[illegible] top and the absence of anything in the nature of a 'neck' make the contents easily accessible.

An innovation which will find favour with physicians and pharmacists alike is the printing of the average dose on both container and carton. Much time and trouble will be saved by the addition of these few words.

The change of packings, though not completely comprehensive, affects the majority of the firm's preparations, including Stovarsol Vaginal Compound, Proseptasine, Theogardenal, Gardenal, Arthrytin, Sonalgin and Soneryl. One notable exception to the change is Stovarsol which will continue to be sold in the little red box.

'M. & B. 693'

2-SULPHANILYL-AMINO-PYRIDINE

There has been so much discussion in both the medical and popular press on 'M. & B. 693' that it is already a familiar name to many medical practitioners. The manufacturers have adopted a very cautious attitude with regard to the drug and arranged for an elaborate series of clinical trials to be carried out to determine its precise value. The trials which so far have been completed have amply demonstrated the exceptional properties of 'M. & B. 693' and Pharmaceutical Specialities (May and Baker), Limited, advise us that it is now generally available. Two booklets have been prepared entitled *'M. & B. 693 Biological and Biochemical Data'* and *'M. & B. 693 in the Treatment of Pneumococcal Infections'* and copies will be sent to medical practitioners on request.

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Original Articles

CHEMOTHERAPY IN ACUTE SURGICAL INFECTIONS WITH PRONTOSIL AND ALLIED DRUGS

By P. N. RAY, B.A., M.B., F.R.C.S. (Eng.)
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K. S. ALAM, M.B.
and
B. K. GHOSE, M.B.
House Surgeons to the Additional Surgeon, Medical College Hospitals, Calcutta

THE introduction of a new remedy is usually accompanied by an excess of enthusiastic expectation, which is soon tempered down to reasonable limits on closer acquaintance and wider experience. The chemotherapeutic possibilities of 'prontosil' and allied drugs have not yet been fully assessed; nevertheless it will not be unprofitable to consider the present position. In this paper is embodied the experience gained in 100 consecutive cases of acute surgical infections treated with 'prontosil' and allied drugs.

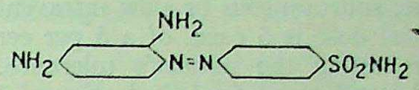
Nomenclature of sulphanilamides

The triumphant entry of 'prontosil' and the publicity given to it in the lay press were soon succeeded by the appearance of close competitors, which have not been an unmixed blessing, although the price of this medicament has thus been brought down to a more economic level. The multiplicity of new drugs of this group has given rise to much confusion in nomenclature and usage. 'Prontosil red', the original preparation, is a registered trade name for a complex azo dye-stuff. 'Prontosil album' is a colourless derivative, chemically described as p-amino-benzene sulphonamide, being the amide of sulphanilic acid. The term *sulphanilamide* has therefore been adopted for it by the Council on Pharmacy and Chemistry of the American Medical Association. There is an allied group, bearing the chemical formula of p-benzyl-amino-benzene sulphonamide, which may conveniently be called *benzyl-sulphanilamide*. It is important to remember the difference in the chemical composition of these drugs because their therapeutic properties vary considerably.

TABLE I

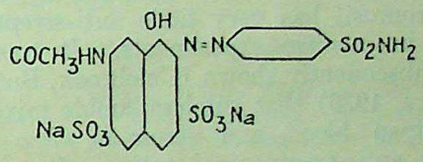
Sulphanilamide	Benzyl-sulphanilamide
1. Prontosil album (Bayer). 2. Sulphonamide-P (Burroughs Wellcome and Co., British Drug Houses Ltd., Allen and Hanburys Ltd.). 3. Streptocide (Evans Sons Lescher and Webb). 4. Sulphanilamide (E. R. Squibb and Sons, Boots Pure Drug Co., Ltd.). 5. Sulfamidyl (Abbot Laboratories).	Proseptasine (Pharmaceutical Specialities, May and Baker Ltd.).

We may here consider, with a little more detail, the characters of the drugs of the prontosil series. It was shown by Domagk, in 1935, that a red diazo dye, prepared by Mietzsch and Klaver, possessed remarkable protective properties against experimental streptococcal infections in mice. This compound, subsequently known as 'prontosil red', is chemically described as 4-sulphamido-2 : 4-diamino azo-benzene and it has the following structural formula :—



It was put on the market in the form of the hydrochloride, possessing slight solubility in water. The tablets at first contained 0.3 gramme (5 grains) but later 0.5 gramme (7½ grains) of the dye. This was the preparation that was first used with success in puerperal sepsis.

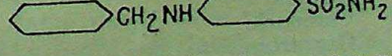
Prontosil soluble.—Under this name a more convenient soluble form of prontosil was soon introduced. It is a complex chemical substance, being the disodium salt of 4-sulphonamino-phenylazo-1-hydroxy-7-acetylamino-napthalene-3: 6-disulphonic acid. The following is its structural formula :—



It was first introduced as a 2.5 per cent solution, but it is now available as a 5 per cent solution for intramuscular injection.

Sulphanilamide.—While studying the pharmacological actions of prontosil, it was observed by the French workers Tréfouël, Tréfouël, Nitti and Bovet (1935) that it was excreted in a partially disintegrated form in the urine, from which p-amino-benzene sulphonamide could be easily extracted. They were able to show that the urine, when injected into mice under similar conditions, was equally potent. It was suggested by them that the much simpler chemical p-amino-benzene sulphonamide was the actual active principle of the coloured prontosil preparations and that the azo-linkage was unnecessary. The simple structure of sulphanilamide is shown by its structural formula :—

Benzyl-sulphanilamide.—'Proseptasine' (May and Baker) is the benzyl derivative of sulphanilamide, having the graphic formula of :—



It is supplied in the form of 0.5 gramme tablets for oral administration.

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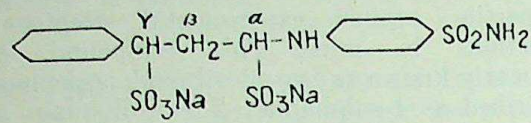
'Soluseptasine' is the trade name for disodium-p (γ-phenyl-propyl-amino) benzene-sulphonamide-α-disulphonate and it has the following structural formula :—



This soluble form is intended for intramuscular, subcutaneous or slow intravenous use. The initial dose is 5 c.cm. of a 5 per cent solution for testing the patient's tolerance. It is followed four hours later by injection of 10 to 20 c.cm. of the solution, which may be repeated in twenty-four hours if necessary.

Mode of action

The mode of action of these drugs has become the subject of much controversy, and various theories have been advanced to explain their anti-streptococcal action. Considering that each of these preparations contains a 'sulphonamide' group in the *para* position, it was readily assumed that sulphanilamide was the actual active principle of the coloured prontosil preparations. This assumption was strengthened by the fact that prontosil has very little anti-streptococcal action in *in-vitro* experiments. It was, however, subsequently shown (Colebrook, Buttle and O'Meara, 1936) that sulphanilamide mixed with the human blood and serum *in vitro* had a definite anti-streptococcal action. It was later found (Fuller, 1937) that prontosil red compounds were split up in the body into sulphanilamide and its derivatives and were excreted in the urine (Tréfouël, Tréfouël, Nitti and Bovet, 1935). It was then *presumed* that sulphanilamide was the only effective agent.

Professor Domagk has opposed the 'sulphonamide hypothesis' on the strength of convincing biochemical experiments. It has been argued (Brown and Bannick, 1937) that if sulphanilamide is the active therapeutic factor in 'prontosil', the excellent results obtained with a daily dose of 40 to 100 c.cm. of prontosil solution (2.5 per cent) are very puzzling. For on analysis 100 c.cm. of prontosil solution yield only 0.73 gramme or 11 grains of sulphanilamide! This argument holds good even for the new 5 per cent solution. As to the *modus operandi*, the views of Professor Domagk (1935) appear to be worthy of acceptance. It seems that prontosil exerts its anti-bacterial action directly as well as through increasing the immunological reactions of the organism. There is, however, little doubt that less complicated chemicals will be introduced in the not distant future (Hoerlein, 1937). It has been our experience too that prontosil red preparations are superior to sulphanilamide owing to their influence in bringing about a subsidence of fever, reduction in death rate, and lessening of complications.

Record of cases

The remarkable action of prontosil in streptococcal infections of various types has been fully confirmed by accumulated experience. Its action in puerperal infection has been remarkable; the rate of mortality has been brought down from 13.5 per cent to 1.4 per cent (Foulis and Barr, 1937). Anselm (1935) was so impressed with the result of prontosil in septic abortions that he undertook the treatment of puerperal infection irrespective of the bacteriological diagnosis. In every case the result was very good. In erysipelas, the result was no less satisfactory (Schreus, 1935), and it was confirmed by further experience (Snodgrass and Anderson, 1937).

We hope that an analysis of our own cases will not be unworthy of consideration. The first 70 cases of the series were treated by *oral administration* of the drug. As the result of experience thus gained, a method was evolved combining both intramuscular and oral administration.

TABLE II

	Disease	Number	Average stay in hospital (in days)	Number cured	Remarks
1	Streptococcal septicæmia ..	3	..	2	
2	Erysipelas, facial ..	6	8	6	
3	Cellulitis	10	13.4	5	Four cases of cavernous sinus thrombosis.
4	Acute osteomyelitis ..	6	..	5	Frontal osteomyelitis—one died.
5	Chronic osteomyelitis, jaw ..	4	..	2	Broncho-pneumonia—two died.
6	Compound fracture ..	7	..	7	
7	Gangrene	5	..	5	
8	Acute funiculitis	2	8	2	
9	Filarial epididymo-orchitis and cellulitis.	6	21	6	
10	Abscess	9	..	9	
11	Carbuncle	1	..	1	
12	Gonorrhœa	1	..	1	
13	Cellulitis after burns ..	10	..	10	

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The majority of the cases of this group could be definitely regarded as serious, particularly the cases of cellulitis and septicæmia.

TABLE III

Number of cases	Cures		Deaths		Remarks
	Number	Percentage	Number	Percentage	
70	61	87.1	9	12.9	Including late cases of sinus thrombosis.
64	61	95.3	3	4.7	Excluding four late cases of sinus thrombosis and two of broncho-pneumonia.

If the six moribund cases of sinus thrombosis and septic broncho-pneumonia were excluded, the rate of mortality would amount to 4.7 per cent, which may be regarded as a satisfactory improvement.

Acute funiculitis and epididymo-orchitis of filarial origin

A dramatic result was seldom missed in cases of acute funiculitis and scrotal cellulitis of filarial origin (case 6). It may be remembered that, in this condition, a secondary infection, not infrequently streptococcal, is not necessarily present (Ray, 1934). In a number of cases both the blood culture and culture of aspirated fluid were negative for the streptococcus.

TABLE IV

	Disease	Number of cases	Number of days to fall of temperature	Highest average temperature	Remarks
1	Erysipelas	5	2.4	102.2	
2	Cellulitis	10	4.0	102.0	Non-diabetic.
3	Cellulitis following compound fracture.	4	5.8	102.0	Cases admitted into hospital with this complication.
4	Acute appendicitis ..	2	2.5	100.8	Following acute tonsillitis.
5	Filarial funiculitis and epididymo-orchitis.	7	2.6	102.7	Irrespective of the secondary bacterial infection.
6	Gas gangrene	2	2.5	102.2	Mixed anærobic and streptococcal infection.

Acute streptococcal infections : erysipelas, septicæmia, cellulitis

A study of the latter series of 30 consecutive cases of acute surgical infection is not unprofitable (table IV). Prontosil red solution was injected daily intramuscularly in addition to the oral administration of prontosil red or album tablets. There were a number of dramatic results. This line of treatment was carried out in a number of cases of septicæmia, complicating cellulitis, lacerated wounds, and untreated compound fractures, which were brought to the hospital in a grave state of infection. The effect of prontosil in streptococcal septicæmia was undisputable (case 1), but it was found equally effective in staphylococcal infection (case 2). The value of pre-operative prontosil therapy in cases of undoubted surgical risk is well illustrated in these two cases. In cellulitis (case 3) the result was invariably satisfactory. In erysipelas, the temperature was brought down to normal, on an average, within three days (cases 4 and 5). In cases of facial cellulo-cutaneous erysipelas the normal was touched on the fourth day. In no case in this series was any anti-streptococcal serum given. Gmelin (1935) reported a similar fall of temperature on the second or third day.

Gas gangrene and anærobic infections

A few words on the treatment of gas gangrene, of which excellent reports have already been published (Bohlman, 1937), will not be out of place here. We have already mentioned two cases, in each of which the patient was delirious and both anærobic organisms (*B. welchii*) and *Streptococcus hæmolyticus* were present (case 7). In one case, owing to the drowsy semi-conscious state of the patient and the positive history of an accident, it was not quite clear whether he had not a head injury in addition; as no permission for a high amputation was obtained from the relatives, 'prontosil' was injected as a last desperate resort, and in 24 hours the temperature came down with return of consciousness ! The limb was later amputated without any further complication. In every case of street accident, a prophylactic dose of anti-gas

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gangrene serum was administered as a routine measure.

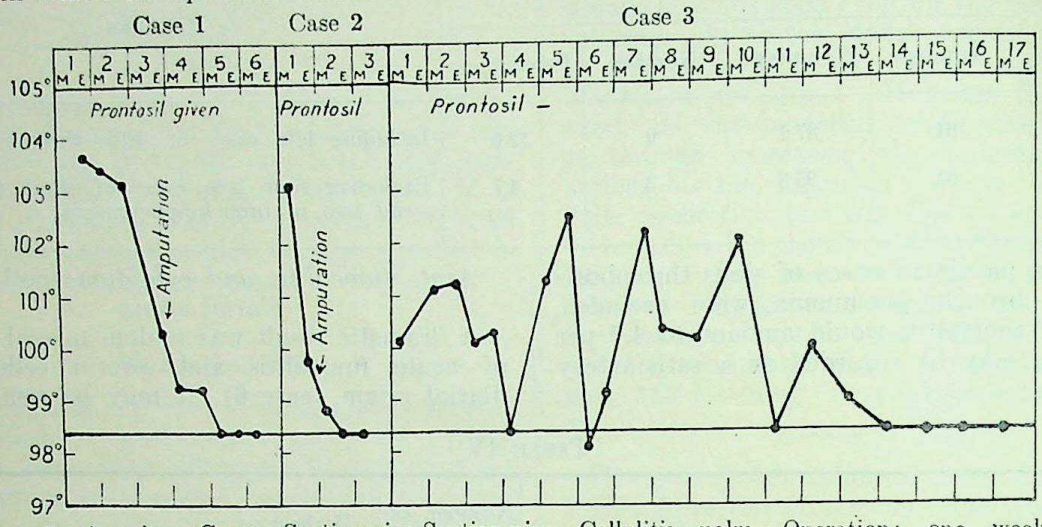
Prontosil therapy as an adjunct to operative measures

We can divide all cases into two broad groups: (*i*) those in which no operative treatment was required, and (*ii*) those in which further operative procedures were indicated. To the first group belong the majority of cases of erysipelas, septicæmia following trivial injuries and acute funiculitis and epididymo-orchitis of filarial origin. To this group may also be assigned puerperal infection, post-operative peritonitis, acute tonsillitis and cervical lymphadenitis and Ludwig's angina. In the last two conditions, Klee and Römer (1935) seem to be the first who tried 'prontosil' with excellent results. By its timely administration in acute funiculitis, it may be claimed that in our series there was not a single fatal case. In septicæmia and cellulitis following furuncles and so-called minor injuries, the results were invariably satisfactory (cases 8 and 9). It would be somewhat difficult to assess the value of prontosil in cases of the second group, which comprised neglected infected compound fractures, spreading cellulitis and infective gangrene. It is to be clearly understood that prontosil medication is no substitute for operative treatment. This drug must be regarded as a potent adjuvant to timely surgical interference, if this is necessary. As a pre-operative measure in cases of utmost gravity, prontosil cannot be surpassed. In two cases of post-operative broncho-pneumonia after high abdominal section, prontosil therapy proved to be very effective.

Urinary infections and gonococcal urethritis

It will be evident from our statistics that prontosil possesses a truly specific action on various types of streptococci but particularly the hæmolyticus. It also appears to possess a very pronounced action against staphylococcal and gonococcal infections.

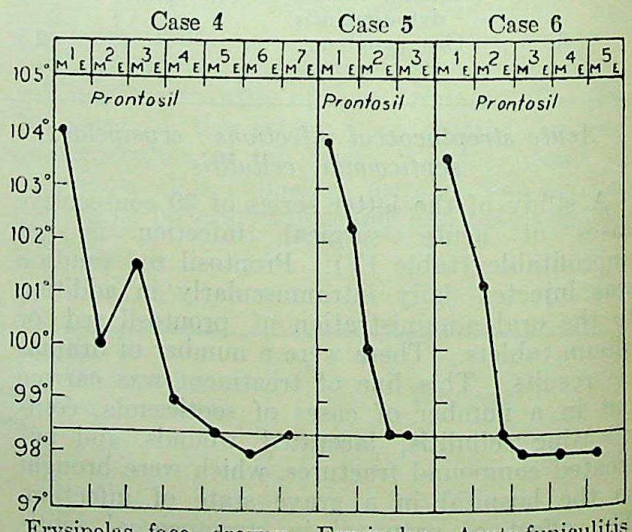
An instance of the unexpected efficacy of prontosil is seen in cases of urinary infection. In spite of the periodic claims to the discovery of new and specific disinfectants, it cannot be said that the ideal remedy has yet been discovered. The action of prontosil is most marked in acute cystitis, but chronic cystitis, with retention or pyonephrosis, does not show any marked improvement. Helmholz (1937) is of opinion that prontosil is bactericidal for the *Staphylococcus aureus*, *Escherichia coli* and organisms of the proteus and pseudomonas group but it seems to have no action on *Streptococcus fæcalis*. It also seems to be more effective in alkaline than in acid urine. Its action in gonorrhœa was accidentally noticed by us.



Septicæmia: Comp. fracture. Culture of pus: *Strept. hæm.*

Septicæmia: Comp. fracture. (Blood culture: *Staph. aureus.*)

Septicæmia: Cellulitis palm. Operation: one week previously. Multiple incisions. Prontosil injections: 10.5 c.c. i.m. daily, one week after operation. Blood culture (before administration of prontosil): no growth.



Erysipelas face, drowsy. H., F., aged 60.

Erysipelas leg. Jew, M., aged 20.

Acute funiculitis H., M., aged 20.

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According to Cokkinis (1937) a clinical cure is obtained in about a week's time after oral administration of the drug. Orr (1937) reports 87 per cent recovery with complete absence of complications.

Dosage and modes of administration

In the new packing of prontosil preparations, the tubes contain 20 tablets of 0.5 gramme (7½ grains) each and 'prontosil soluble' 5 c.cm. ampoules of a 5 per cent solution.

In cases of moderate severity, one ampoule is injected intramuscularly twice daily together with one tablet of prontosil red every three hours until the temperature comes down. In about 6 per cent of cases prontosil red gives rise to vomiting or anorexia. In these cases prontosil album is better tolerated.

In cases of great severity or when the patient is drowsy or unable to swallow, three or four ampoules may be injected without any untoward result. It is seldom necessary to continue the injections after the temperature touches normal. The oral administration is continued for another three or four days, but only 2 or 3 tablets need be given daily.

As a prophylactic measure in infected cases or where complications are apprehended, one or two ampoules are injected before any operative measure is carried out.

The usual recommended average maximum daily dose for adults of normal weight is 5 grammes (75 grains), given in 3 or 4 doses after meals. Usually 3 to 4 grammes are sufficient. It has been our practice to administer glucose freely during the period of intensive prontosil therapy. As to age and sex, we have found no dangers or untoward effects. As a rule, children are given half the adult dose and infants a quarter or sixth of the adult dose. Infants are given the powdered tablet in human milk or in tea (Püschel, 1935).

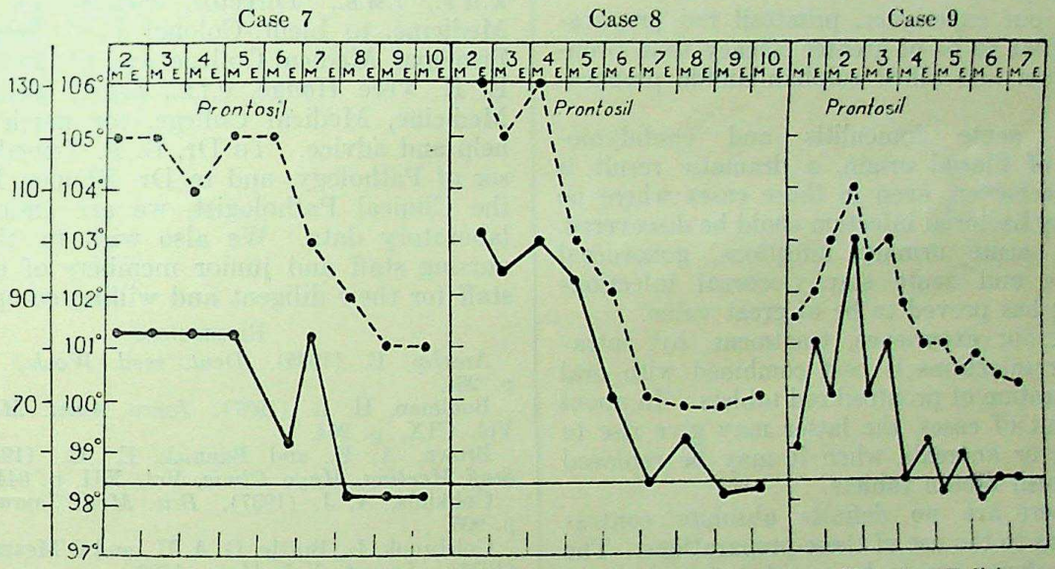
Prontosil soluble is not to be injected intravenously and it is not necessary to do so. In toxic cases, maintenance of water balance is as important as a liberal supply of glucose.

Contra-indications.—It does not appear that there are any absolute contra-indications. In nephritis and hepatic cirrhosis no more than the usual caution is necessary. In diabetes, pregnancy, cardiovascular disease and severe toxæmia, there are no definite contra-indications.

Tolerance and manifestations of toxicity

In this series we have not met with any disagreeable reactions. In about 6 per cent of cases, prontosil tablets may give rise to vomiting or anorexia. We have not met with any cases of cyanosis. Of the manifestations of toxicity, sulphæmoglobinæmia is probably the most important. It is believed that the combination of hæmoglobin with the free hydrogen sulphide in the alimentary canal is indirectly promoted by the possible formation of p-acetyl-amino-benzene sulphonamide in the body during sulphanilamide therapy. Preparations, such as liquorice powder, containing sulphur should also be avoided. Hydrogen sulphide is more easily liberated when the contents of the large intestines are liquid. Consequently, anthracene and saline purgatives are best omitted. The use of the commoner aniline derivatives, like phenacetin, acetanilide, phenazone, amidopyrine and sulphonal are also deprecated.

The urine becomes yellowish red in colour after the administration of prontosil red preparations and it may continue so after withdrawal of the drug for 48 hours. To remove prontosil stains from linen a solution containing 2 grammes of soda and 3 grammes of sodium hydrosulphite per litre may be used, but 3 grammes of 'burmol' in a litre of water will be found more convenient.



Gas gangrene and septicæmia. Smear and culture: Anærobic organisms + *Strept. hæm.*

Septicæmia culture of pus: *Strept. hæm.* + *Staph. aur.*

Gluteal cellulitis.

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Diet.—Light or milk diet is well tolerated while meat and egg dishes should be avoided.

Poisoning by Elixir Sulphanilamide.—A brief reference to this unfortunate episode in the United States of America may be made here without moralizing. An elixir was made up containing 10 per cent sulphanilamide and 72 per cent diethylene glycol and two or three teaspoonfuls were recommended every four hours for one or two days. The number of deaths exceeded 60. The deaths were not by the sulphanilamide but by the solvent diethylene glycol (Editorial, 1937 and 1938).

Summary

1. Prontosil and allied preparations have definite anti-streptococcal action and are therefore indicated in all cases where the *Streptococcal hæmolyticus* is implicated.

2. In erysipelas and streptococcal septicæmia, prontosil red may be regarded as a specific. In none of these conditions need anti-streptococcal serum be given.

3. In our experience, prontosil red preparations appear to be of greater efficacy than prontosil album and allied sulphanilamide preparations.

4. In acute funiculitis and epididymo-orchitis of filarial origin, a dramatic result is usually achieved, even in those cases where no secondary bacterial infection could be discovered.

5. In acute urinary infections, gonococcal urethritis and acute staphylococcal infections the drug has proved to be of great value.

6. In our experience, treatment by intramuscular injections is best combined with oral administration of prontosil red tablets. In about 6 per cent of cases, the latter may give rise to vomiting or anorexia when it may be replaced by prontosil album tablets.

7. There are no definite absolute contra-indications to the use of these preparations. The following drugs are to be avoided during prontosil therapy: anthracene and saline purgatives, sulphur-containing preparations and commoner aniline derivatives like phenacetin, acetanilide, phenazone, amidopyrine and sulphonal.

8. In a series of 70 consecutive cases, excluding six late cases of sinus thrombosis and septic broncho-pneumonia complicating facial cellulitis, the rate of mortality was 4.7 per cent.

9. In a subsequent series of 30 consecutive cases, the rate of mortality was *nil*. In case of erysipelas the highest average temperature was 102.2°F. which was brought down to normal in 2.4 days. In facial cellulitis, the normal was touched on the fourth day. In two cases of gas gangrene, the result was unexpectedly gratifying. In this group of cases, intramuscular injection of prontosil soluble was combined with oral administration of the drug.

10. This drug may be regarded as a powerful adjuvant to timely surgical interference, if this

(Continued at foot of next column)

THE SURGICAL TREATMENT OF EPIDEMIC DROPSY GLAUCOMA

By E. O'G. KIRWAN, M.D., F.R.C.S.I.
LIEUTENANT-COLONEL, I.M.S.
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In a previous article written by me in 1934, I pointed out that, as long as the visual fields in this variety of glaucoma show no defect, immediate operation can be postponed in the hope that the general disease and with it the glaucoma will be cured before the optic nerves become permanently damaged by the increased intra-ocular tension.

The patient should be kept absolutely quiet and should refrain from eating rice or mustard

(Continued from previous column)

is necessary. As a pre-operative measure in cases of utmost gravity, prontosil can hardly be surpassed.

In conclusion, we wish to record our indebtedness to Brevet-Colonel R. N. Chopra, C.I.E., K.H.P., I.M.S., Director, School of Tropical Medicine, to Lieut.-Colonel T. C. Boyd, I.M.S., Principal, Medical College, and to Lieut.-Colonel E. H. Vere Hodge, C.I.E., I.M.S., Professor of Medicine, Medical College, for much valuable help and advice. To Dr. B. P. Tribedi, Professor of Pathology, and to Dr. Bhupen Mukherji, the Clinical Pathologist, we are indebted for laboratory data. We also wish to thank the nursing staff and junior members of our house staff for their diligent and willing co-operation.

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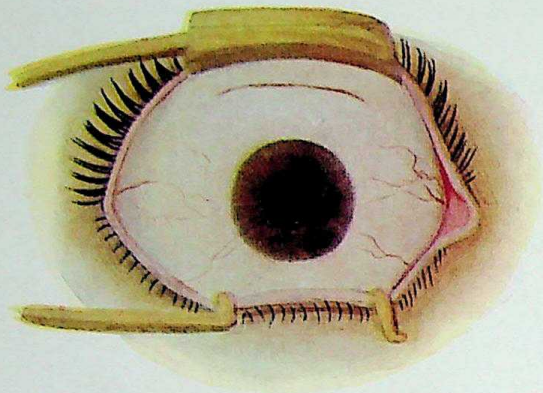
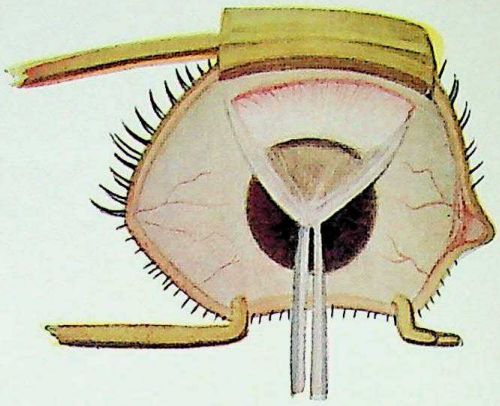
Plate XV

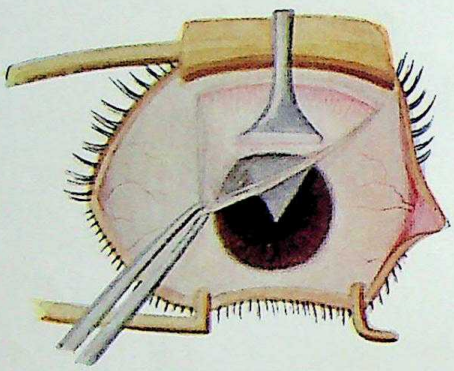
STAGES OF THE OPERATION FOR EPIDEMIC DROPSY GLAUCOMA



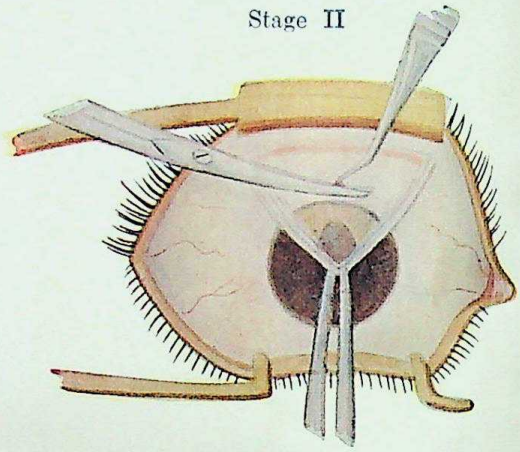
Stage I



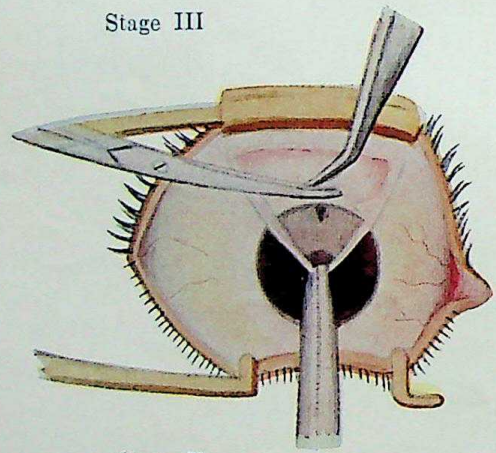
Stage II



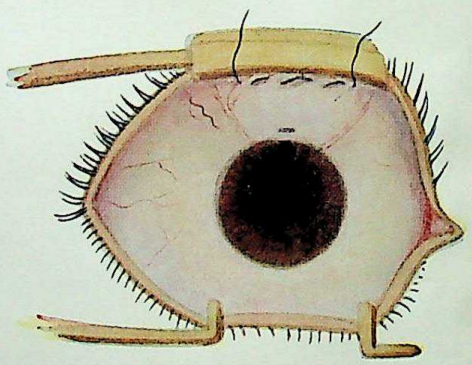
Stage III



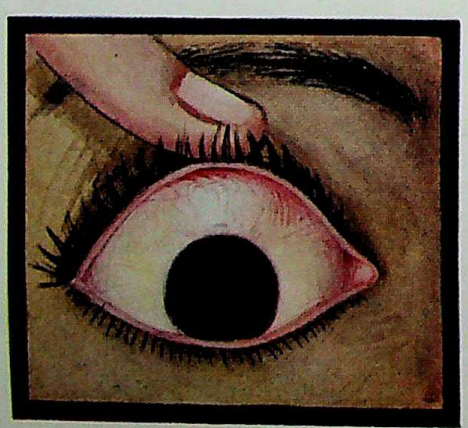
Stage IV



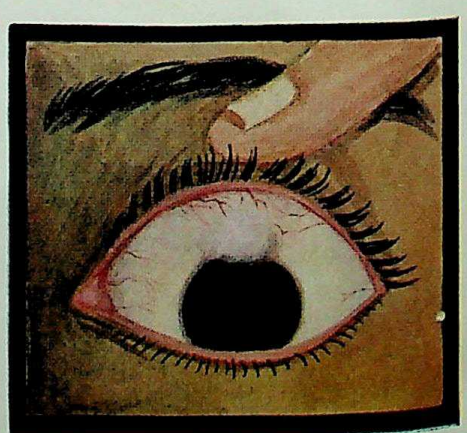
Stage V



Stage VI



Anterior sclerectomy after 2 weeks



Sclero-corneal trephining

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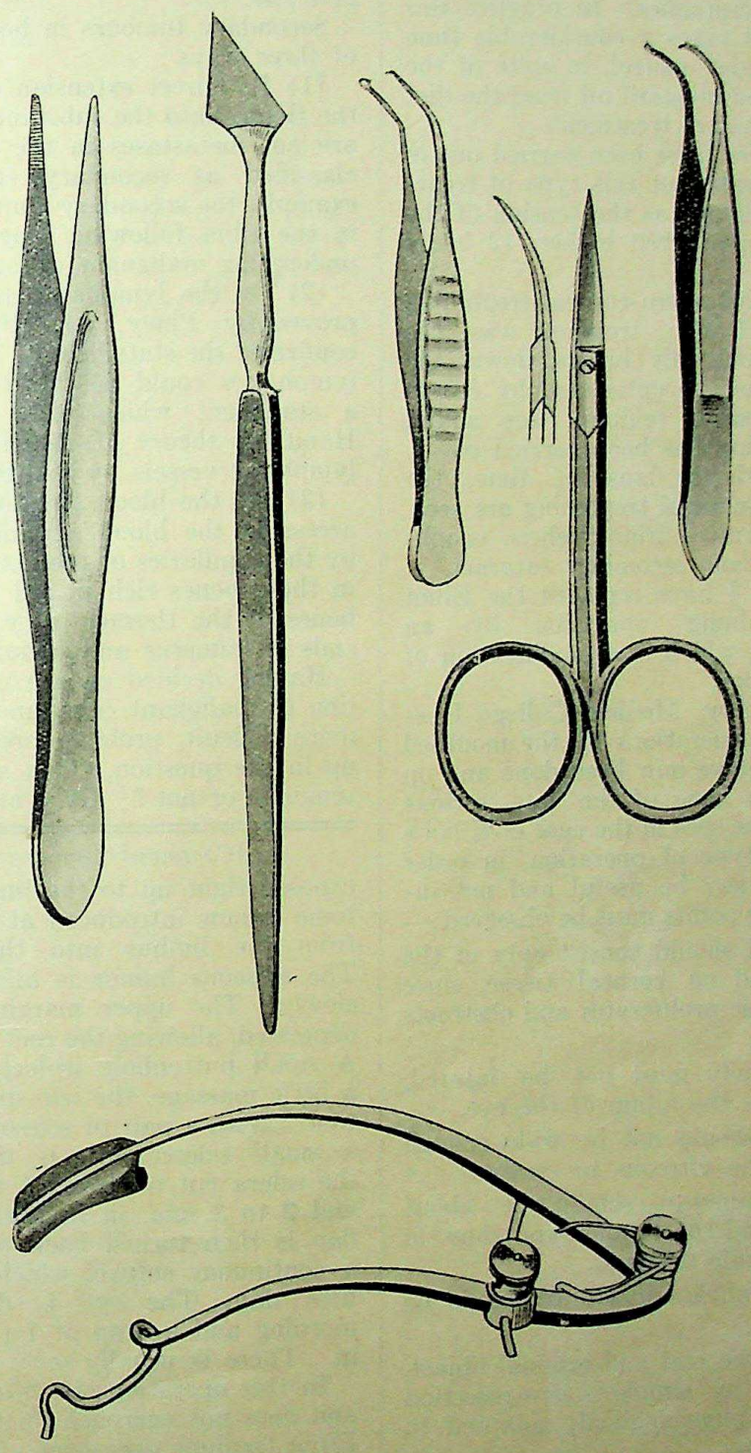

Instruments for the surgical treatment of epidemic dropsy glaucoma.

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oil, but, as soon as defects in the visual fields become evident, operation should not be delayed. One would think in this type of glaucoma, which is a temporary one, that a temporizing operation could be done, as the patient will get well spontaneously when the infection is removed, and that all that is necessary is to keep the tension down until this end is achieved by repeated anterior sclerotomies. In practice this is not sufficient, as it takes a considerable time to get the disease under control, in spite of the withdrawal of rice and mustard oil from the diet and the use of eliminative treatment.

Anterior sclerotomies have been carried out in a large number of cases, but this type of treatment has been abandoned, as the tension of the eye becomes as high, or even higher, 12 hours after operation.

In the past the Elliot sclero-corneal trephining operation with a 1.5 mm. trephine was the popular one; it undoubtedly brings down the tension to normal and the optic atrophy ceases to progress. The tension seldom rises again, once the decompression has been carried out.

Unfortunately, with the lapse of time, the bad results of sclero-corneal trephining are seen. These are a low form of irido-cyclitis, enophthalmitis, hypotony, and secondary cataract.

For the last year I have replaced the Elliot sclero-corneal trephining operation by an anterior sclerectomy, which is a modification of the Lagrange operation.

In the Eye Infirmary, Medical College Hospitals, Calcutta, 192 operations by the modified Lagrange technique have now been done and up to date I have seen none of the late serious complications that one sees in the case of Elliot's operation. In this type of operation, in order that the operation may be useful and not injurious, the following points must be observed:—

(1) Tissue excised should consist only of the sclerotic and no corneal tissue, since corneal tissue proliferates and obstructs the opening.

(2) The ciliary body must not be injured, because it is the hilum of the eye.

(3) The incision should not be wide enough to permit the vitreous to escape.

(4) The site of puncture should be about 2 mm. behind the limbus and thus in purely sclerotic tissue.

(5) A small buttonhole iridectomy should be done.

(6) Fistulization, the real and original object, is obtained by simple sclero-resection at the site physiologically adapted to it.

The operation is easy and rendered as external as possible.

The steps of the operation are as follows :—

Under local anæsthesia a conjunctival flap is turned down. The surface of the sclera is

(*Continued at foot of next column*)

THYROID METASTASES IN BONE

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This subject interests both the surgeon and the pathologist, because of the questions, hard of solution, to which it has given, and still does give rise.

Secondary tumours in bone must arise in one of three ways :

(1) By direct extension of the tumours from the tissues into the substance of the bone. Such are not metastases in the true sense, but are classified as secondary contact tumours, for example, the secondary contact carcinoma found in the tibia following long standing ulceration undergoing malignant change.

(2) By the lymphatic stream; a method disproved by Piney, who by his investigations confirmed the statement of Roger and Josué that lymphatics could not be demonstrated in bone, a statement which cast doubt on Sampson Handley's theory of centrifugal permeation of lymphatic vessels by malignant cells.

(3) By the blood stream; the emboli gaining access to the blood stream and being held up by the capillaries of the bone marrow, especially in those bones rich in red marrow, such as the bones of the thoracic cage, pelvis, skull, upper ends of humerus and femur.

Having decided on the method of dissemination of malignant cells, another, and perhaps, a more difficult, problem presents itself, summed up in the question, 'Can a benign tumour disseminate or not?' It is an axiom in pathology

---

(*Continued from previous column*)

exposed right up to the limbus. A small keratome is now introduced at a distance of 2 mm. from the limbus into the anterior chamber. The aqueous humor is allowed to escape very slowly. The upper margin of the wound is depressed, allowing the root of the iris to present. A small buttonhole iridectomy is done. With a little massage, the iris springs back into position. With a pair of scissors curved on the flat, a small sclerectomy is done, the portion of the sclera cut off being 1 to 1.5 mm. in height and 2 to 3 mm. in breadth. The conjunctival flap is then turned back and stitched up with a continuous suture, which is removed on the fifth day. The eye is dressed on the third morning and a drop of 1 per cent atropine put in. There is usually very little reaction.

In this operation the filtrating cicatrix is flat and does not encroach on the cornea, as in the Elliot trephine operation. One should remember Lagrange's advice (1937):—'Do not touch the cornea, for it proliferates, and do not touch the ciliary body, for it is resentful'.

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Plate XVI

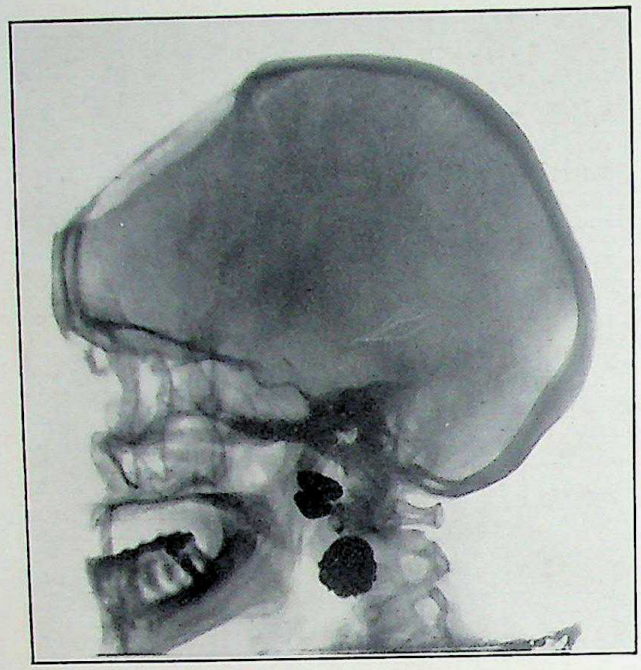

Figure 1

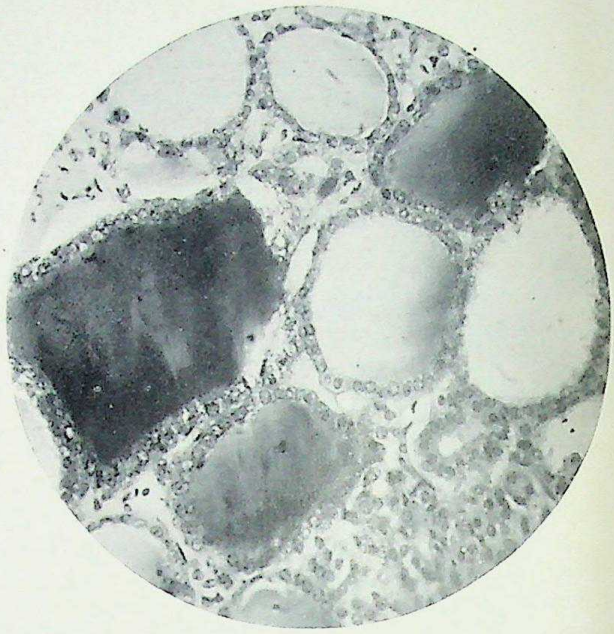

Figure 3

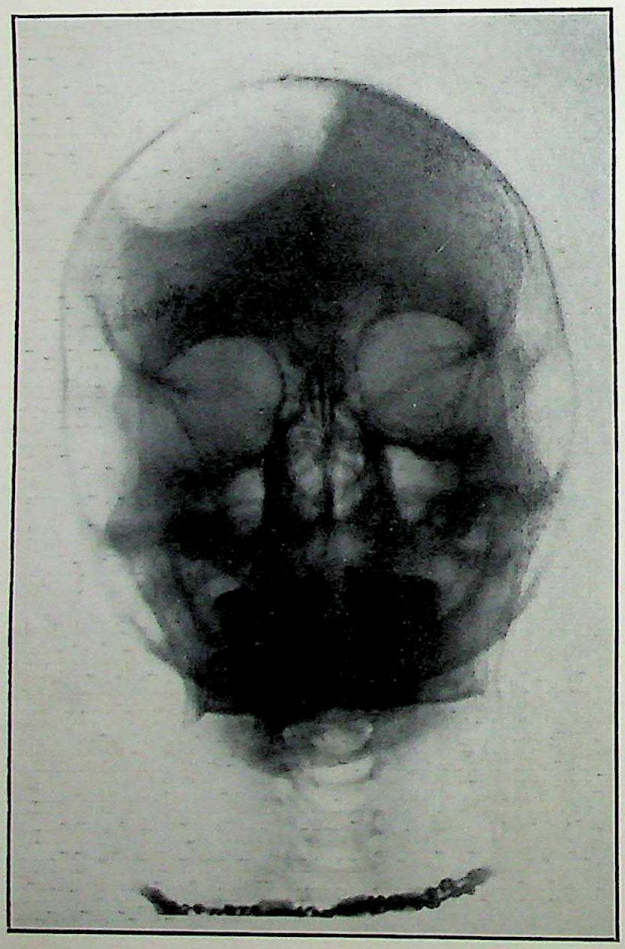

Figure 2

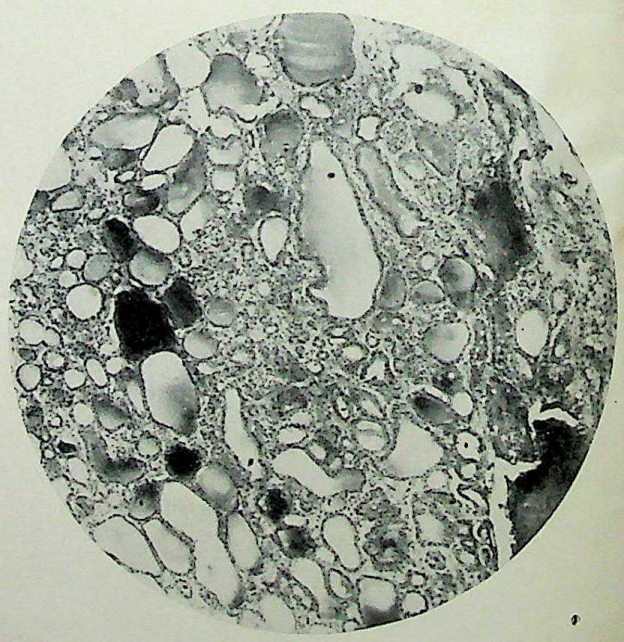

Figure 4

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that dissemination is a feature of malignant neoplasms and of these alone; a benign tumour would cease to be benign did it metastasize.

Considering in particular the thyroid gland, confusion has arisen because thyroid metastases have been found to be functionally active and to consist of what microscopically appears to be normal thyroid tissue. The classical case is that of Eiselsberg, in which cachexia strumipriva followed removal of a carcinomatous thyroid; this was relieved when a secondary deposit appeared in the sternum, the patient relapsing when the sternal growth was removed. This leads to the question, 'Can a malignant thyroid produce a benign or a malignant metastasis?'

A normal thyroid, a colloid thyroid, a thyroid containing a small adenoma, a thyroid containing a malignant adenoma, each has at some time or other been reported as having produced a metastasis consisting of normal thyroid tissue.

In the case of the malignant gland, the French term 'the return towards the normal' simply describes what, so far as exhaustive examination can show, appears to be normal; the critic, however, affirms that time and further pathological investigation would show that both the thyroid gland and the metastasis were far from normal.

From a pathological standpoint the dividing line between malignant and non-malignant can nowhere probably be drawn with so great difficulty as in this matter of thyroid tumours. The epithelial appearances, the character of cells, the mitoses, the structure of vesicles, all vary so widely, not only in different malignant adenomata but in one and the same adenoma, that a personal factor, even amongst skilled microscopists and able pathologists, seems to cloud the diagnosis: tissue, passed as normal by one, is declared malignant by another equally capable pathologist.

Is it surprising, then, that anomalous names, such as metastasizing adenoma, benign metastasis, benign metastasizing goitre, have found their way into the literature of these puzzling conditions?

The clinical fact, or observation, remains that tumours identical with normal thyroid tissue do occur in bones of patients who present no apparent abnormality of their thyroid glands.

That these 'benign metastases' are never single (Eberhardt), but always found at post-mortem examinations to be multiple, is not the opinion of Joll, who affirms that even after careful post-mortem examination the osseous growth may be the sole metastasis present. Either statement would be naturally difficult to prove even after the most meticulous examination.

Joll (1923) presents a series of 44 cases of metastases in bone where either no abnormality, or a benign form of tumour, was found in the thyroid.

The interest in these problems was again aroused and the difficulties in clinical diagnosis were demonstrated when a case was admitted into my wards in the General Hospital, Madras, in February of this year, presenting the features of a meningioma.

The patient, a female Hindu aged about 55, stated that a lump on the right side of her head, which had been there for over one year, had begun to increase in size, and was now definitely painful. There was no history of headache, visual disturbance or of vomiting. Examination revealed a tumour mass about the size of a lime involving the upper anterior aspect of the right frontal bone. The skin was freely movable over the tumour, which was soft and pulsatile. Over the skin ran several dilated superficial veins. Palpation gave rise to some slight discomfort and confirmed, more fully than did inspection, the pulsatile nature of the growth. The woman affirmed that, apart from the tumour, she was in perfect health and could give no history of any previous illness.

X-ray examination showed a large erosion in the right frontal area (plate XVI, figures 1 and 2).

A diagnosis of meningioma was made.

On 7th February, 1938, I performed the first stage of the removal of the so diagnosed meningioma. A horse-shoe flap, base downwards, at the superciliary ridge was made. To give access, a ring of bone about 3/8 inch broad was removed all round the tumour, the bone being freed from the tumour mass with the aid of scissors. This done, the scalp flap was sutured back in position.

On 18th February, the second stage of the operation was done. The 'dura', which encapsuled the tumour, was cut with the diathermy knife, bleeding being readily controlled by hot pads, where the coagulating current proved insufficient. Only one large vessel had to be ligated and the tumour was readily enucleated.

On removal it was evident that the 'dura', which I imagined had been incised, was still lying intact on the brain surface, which showed no signs of having been subjected to any degree of pressure.

The diagnosis of a gumma, or sarcoma, was now made but with no great enthusiasm for either.

On 22nd February I received the following report from Dr. Tirumurti, Professor of Pathology, who kindly examined the specimen for me:

'The specimen suspected to be a meningioma appears on microscopical examination to be composed of typical thyroid tissue. It is not a meningioma. The condition is probably one of "benign metastasizing struma"'.

This report led to a careful examination of the patient's thyroid gland and further radiological examination of the skeleton. Nothing abnormal could be detected about the patient and she was discharged well on 14th March.

Four months later the patient was written to and appeared in hospital, stating that she had no complaints and was perfectly well. Examination, however, revealed, in the right lobe of the

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thyroid, a small nodular mass about the size of a hazel nut, of which the patient was quite unaware.

Further radiological examination of the skeleton proved negative. The question of operation and removal of the right lobe of the thyroid was considered, but the patient settled any doubts by deciding that there would be no operative interference in her case.

The differential diagnosis in such a case must be difficult. Cases presenting such features as the one reported have been mistaken for meningioma, for gummata and for primary sarcoma of bone, though the latter diagnosis should never be made before the possibility of malignant disease elsewhere has been eliminated.

Other conditions might, of course, be considered, though more readily excluded, such as lipoma, dermoid cyst, meningocele, hæmatoma, subpericranial abscess. *X*-ray investigations will materially help in the diagnosis, but a metastatic tumour may simulate a primary sarcoma, because the perpendicular spicules of new bone are not always present in sarcoma and are not invariably absent in the secondary tumour.

The subject of treatment is a controversial one.

Barthels states that the thyroid carcinoma, which produces bone metastases is of relatively low virulence and, therefore, to remove a single metastasis could not be described as meddlesome surgery and that the removal could be followed by thyroidectomy.

'As a rule the benefit to be expected from operation in secondary growths of bone is but transitory. Recurrence, either locally or in other bones, must soon end life. There are a few striking exceptions' (Joll).

In Joll's opinion, because of these exceptions, resection of the secondary tumour, if feasible, might be carried out and followed by thyroidectomy.

The interest in this case lies in these facts :

(1) that no thyroid history could be obtained;

(2) that clinically and by radiological examination only one skeletal metastasis could be found;

(3) that the thyroid gland, until recently, presented no detectable abnormality;

(4) that the suggestion that a benign thyroid may produce either a benign or a malignant metastasis is not reasonable, because, even if a biopsy were permitted and the result of examination of the thyroid were returned as 'normal thyroid gland', time would prove that the thyroid gland was not normal and that an insidious atypical malignant growth had been overlooked; and

(5) that a malignant thyroid may produce a benign metastasis. Again, time would prove that the metastasis was not benign.

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SPONDYLOLISTHESIS

By M. G. KINI, M.C., M.B., M.Ch. (Orth.), F.R.C.S.E.
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Low back pain is very common in India. Out of 300 cases examined and treated for low back pain within the last 7 years, only one case showed a true spondylolisthetic condition. It is difficult to state the incidence of this condition in India as there are no published records. Neugebauer in 1884 described this condition first among women. On investigation it is reported that no cases of spondylolisthesis were noticed in the Government Maternity Hospital, Madras, where more than 3,000 deliveries are conducted every year. The following case illustrates a true spondylolisthetic condition :—

A Hindu male, aged 35, was admitted in 1936 for the treatment of constant pain in the lower part of the left half of the back and buttocks. He was a *dhoby* (washerman) by occupation. This pain started suddenly while lifting a bundle of wet clothes eight years ago. It was treated by massage as a case of sprain. He recovered and carried on his work. Ever since he has had similar attacks and with the same treatment he got relief. Three months before admission, he found the pain was more severe and constant.

On examination, the spine was found to be foreshortened with a groove encircling the body at the level of the loin. The hollow above the sacrum was very

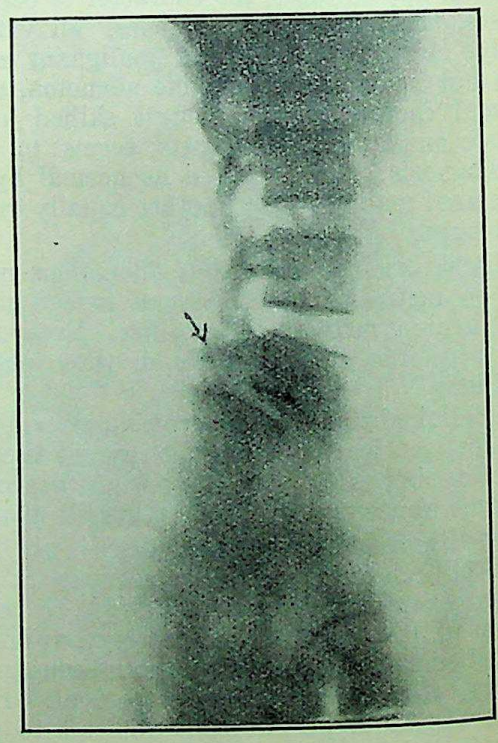

Fig. 1.—*X*-ray picture which shows the slipping forward of the body of the 4th lumbar vertebra with discontinuity between the pedicle and neural arch.

marked. Movement in the lumbo-sacral region was very painful. The hip joint was found to be normal. On *x*-ray examination, the body of the 4th lumbar vertebra was found to have slipped forward leaving the lamina behind (figure 1). The 5th lumbar was found

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to be sacralized completely. A cervical rib was found on both sides (figure 2).

Under spinal anæsthesia, a bone graft of Albee's type was done, fixing two spines above and two spines below the 4th lumbar, on 28th July, 1936

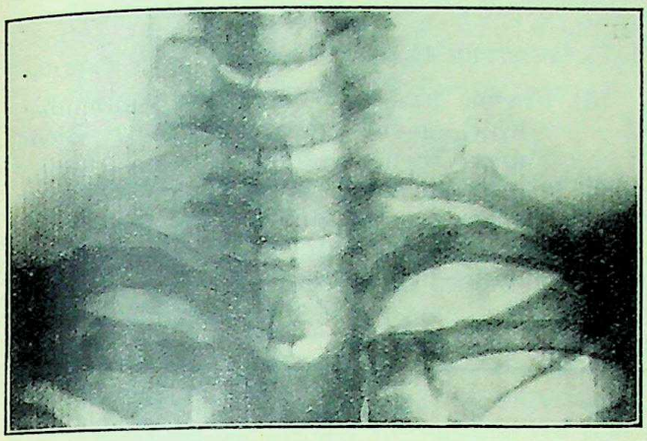

Fig. 2.—*X*-ray picture of the lower part of the neck and upper part of the chest showing cervical ribs on both sides. This shows the existence of more than one congenital abnormality in the spine of this case.

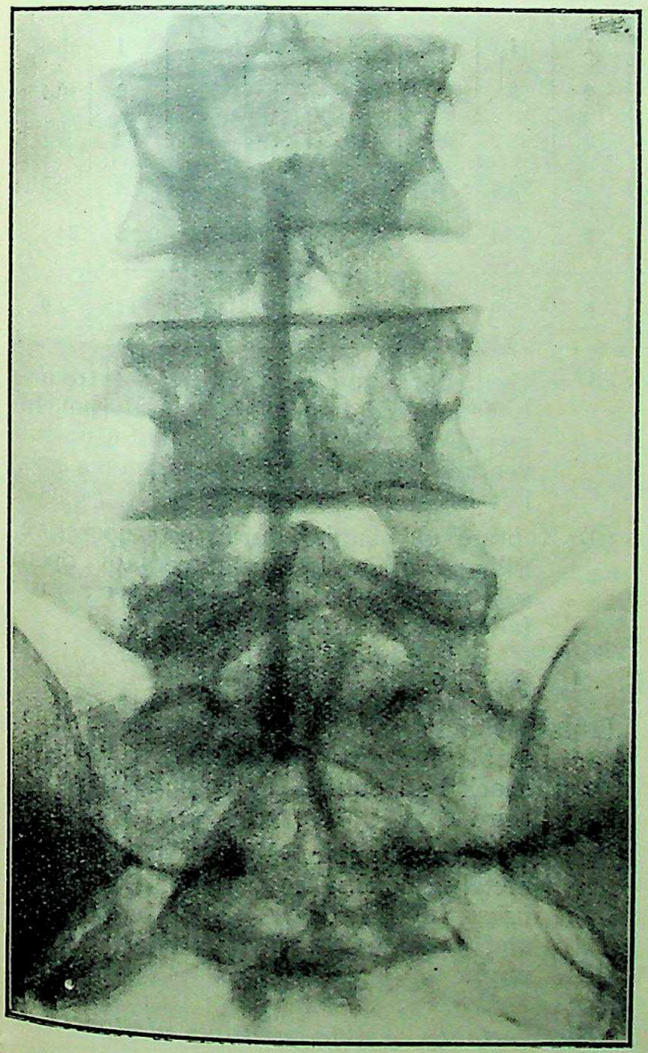

Fig. 3.—*X*-ray photograph of the lower lumbar spine showing the bone graft in position.

(*Continued at foot of next column*)

THE MORTALITY OF OPERATIONS FOR VESICAL CALCULUS IN INDIA

By E. W. HAYWARD, F.R.C.S.E.
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and
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In continuation of the figures published in the *Indian Medical Gazette* of February 1937, we have now been able to analyse the results of a further series of 224 cases done in the Windham Hospital, Jodhpur, between September 1936 and March 1938.

Our methods have not changed, and we need add nothing to the details we have already given of the anæsthetic and operative procedure. The only change that we have made is that

(*Continued from previous column*)

(figure 3). The patient was discharged on 3rd September with advice to report for another operation to fix the bodies in front. It is reported on enquiry that he died six months after discharge from hospital and the cause of the death is not known.

Anatomical study of the specimens of lower lumbar and sacral vertebræ available in the Medical College Museum was done to find out if there are any showing the defect between the neural arch and the pedicle, as pointed out by Willis. No such specimens could be found in the anatomy department of the Medical College, Vizagapatam. Two specimens were kindly lent for study by Professor Koshi of Medical College, Madras, from his collection. They show the lack of fusion of the neural arch with the pedicle.

Points of interest

1. The rarity of such reported cases in India.
2. Spondylolisthesis had occurred in the 4th lumbar with the 5th lumbar completely sacralized.
3. There were cervical ribs on either side with no symptoms, showing that the spinal column had more than one congenital abnormality.

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separate figures for suprapubic lithotomies by the open and closed methods have been kept instead of having them all grouped together.

The number of cases concerned is too small for the drawing of any reliable conclusions but, in so far as any conclusion at all can be drawn, it does not appear to affect the mortality whether the closed or open method is used. The patient of course prefers the closed method as it reduces the time in hospital as well as avoiding the misery of wet dressings, whereas the open is perhaps preferable to an indwelling catheter in cases of high blood urea.

The mortality at different ages is shown in the following table :—

TABLE

Age group	Suprapubic lithotomy									Litholapaxy			Total operations		
	Open cases	Died	Percentage mortality	Closed cases	Died	Percentage mortality	Total cases	Died	Percentage mortality	Total cases	Died	Percentage mortality	Cases	Died	Percentage mortality
1 to 7 years.	57	1	1.75	34	..	..	91	1	1.1	12	..	..	103	1	0.97
8 to 15 years.	13	2	15.4	12	..	..	25	2	8	6	..	..	31	2	6.4
16 to 40 years.	7	1	14.3	4	1	25	11	2	18.2	31	..	..	42	2	4.8
41 to 60 years.	14	2	14.3	8	1	12.5	22	3	13.6	20	1	5	42	4	9.5
61 and over	2	..	..	1	1	100	3	1	33.3	3	1	33.3	6	2	33.3
TOTAL ..	93	6	6.4	59	3	5.1	152	9	5.9	72	2	2.77	224	11	4.9

The causes of death were as follows :—

A. *Age group* 1 *to* 7 *years*

(1) Heat exhaustion on second day after operation in May. No post-mortem examination.

B. *Age group* 8 *to* 15 *years*

(2) Very feeble child with a 2 years history and 75 grammes blood urea for which he was treated for six weeks before operation, twenty-four hours after which he died. Autopsy revealed bilateral pyonephrosis.

(3) Patient was quite fit before and did fairly well for some days after operation. Then blood urea rose steadily to 200 grammes and he died of uræmia 3 weeks after operation.

C. *Age group* 16 *to* 40 *years*

(4) The open suprapubic case faded away and died six weeks after operation, autopsy revealing unilateral pyonephrosis.

(5) The closed suprapubic wound was completely healed and the patient apparently cured except for a bladder which was still rather septic three weeks after operation and was being washed out. Condition suddenly deteriorated and death occurred four days later, no diagnosis being made. No autopsy.

D. *Age group* 41 *to* 60 *years*

(6) Uræmic patient before open suprapubic, which gave temporary relief. Blood urea then steadily rose. Autopsy revealed shrunken kidneys with many adhesions and an enlarged heart with pericardial fluid.

(7) Rupture of bladder during litholapaxy.

(8) Closed suprapubic under local in extremely feeble old man whose basal rhonchi increased after operation, autopsy revealing right lower lobe pneumonia and left basal consolidation.

(9) Rupture of bladder during pre-operative filling, followed by immediate open suprapubic; the patient however just faded away in four days.

E. *Age group* 61 *and over*

(10) Litholapaxy under local as patient too feeble for any anæsthetic. Died of shock and pulmonary complications on third day.

(11) Closed suprapubic. Wound healed completely. Patient faded away with both bases involved and unilateral orchitis and was removed moribund on the 15th day.

The mortality of different types of stones

Again no relationship was noticed between the chemical composition of the stones and the death rate.

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Seasonal mortality

Again in the coldest months of December and January there were no deaths at all. The patients who died for no fully ascertained cause, nos. 1, 3, 4, 5, 8, 10 and 11, all died in the hotter months, except nos. 4 and 8 who died in February and March, respectively. We still feel that adverse climatic conditions may just turn the scales against a case.

The mortality at different concentrations of blood urea

Of the 121 cases over 7 years of age in the series, 104 had their blood urea estimation done before operation, the results being shown in the following table, which seems very definitely to show that the higher the blood urea, the greater the risk. Also open cases seem to do better than closed suprapubics. It is, however, realized that the total number of cases with high blood urea is very small and conclusions must be drawn only tentatively.

The simultaneous occurrence of renal and vesical calculi

Of the 224 cases in this series, 192 had their entire genito-urinary tract radiographed. No dye was used, it being assumed that no shadow in a straight radiogram and no suggestive history meant no kidney stone. Cost was the main reason for not using either an intravenous dye or doing a retrograde pyelogram. Of these 192 cases, in five who had a history of renal colic kidney stones were found in four and a ureteric stone in one, while in four others with no suggestive history kidney stones were revealed. The diagnosis was confirmed at operation in only three cases, as three of the others were considered unfit for operation and three refused it.

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PRE-CANCEROUS CONDITIONS OF THE CERVIX UTERI AND THEIR TREATMENT*

By J. CHAKRAVERTI, M.B. (Cal.), M.C.O.G.,

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A SUMMARY of the survey of the reports of the Public Health Commissioner with the Government of India (Russell, 1935) shows that the

(*Continued from previous column*)

We have therefore had a series of 192 cases of vesical calculus with unsuspected renal calculus present in only just over 2 per cent.

* Read at a clinical meeting of the Obstetric and Gynæcological Society of Bengal, on 4th July, 1937.

TABLE

Blood urea	Suprapubic lithotomy									Litholapaxy			Total operations		
	Open cases	Died	Percentage mortality	Closed cases	Died	Percentage mortality	Total cases	Died	Percentage mortality	Cases	Died	Percentage mortality	Cases	Died	Percentage mortality
25 to 50 ..	25	2	8	13	2	15.4	38	4	10.5	49	2	4.09	87	6	6.89
50 to 60 ..	8	1	12.5	2	1	50	10	2	20	1	..	..	11	2	18.2
Over 60 ..	4	1	25	1	1	100	5	2	40	1	..	..	6	2	33.3
TOTAL ..	37	4	10.8	16	4	25	53	8	15.09	51	2	3.92	104	10	9.61

Summary

There is little to add to the remarks passed in the summary of the previous series, except to say that we hope the reduced mortality, 5.9 per cent for suprapubic lithotomy, can be maintained, if not improved upon, and that the litholapaxy rate of 2.77 will not rise higher, although it must vary according to the number of those who have to be taught to use a lithotrite, an art which we fear some will never learn.

The chief factors affecting the mortality of vesical calculus operations still appear to be the general condition of the patient, his age, his blood urea and to some extent the climate.

The incidence of unsuspected renal calculus in cases of vesical calculus was found to be 2 per cent.

In conclusion we must thank Dr. Bal Kishan Vyas for much help in collecting our information

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incidence of cancer in India stands at a figure not far removed from that in western countries. It also shows that the highest incidence is during the age period of 40 to 50 years, *i.e.*, ten years earlier than in Japan or in western countries and the United States of America.

As regards regional distribution, a preponderating incidence of carcinoma in one organ is counterbalanced by lesser incidence in other organs and disparity between the incidence figures of different provinces appears to be the subject of the same attempt at equilibrium. On the average, the incidence of cancer in the female generative organs is over 50 per cent of all cancers. Of this, cancer of the cervix is the highest, over 75 per cent. As far as is known at present, primary carcinoma occurs more frequently in the uterus than in any other organ and it causes death of one out of every thirty-five women over the age of thirty-five years.

No part of a woman's body undergoes such a strain as the cervix which in an adult is only one inch in length and forms a minor and somewhat subservient part of the whole uterus. From birth to involution this part changes widely in structure. In fœtal life there is the fusion of the two great genital ducts with their solidification and canalization. In infancy and childhood, it occupies an abdominal position forming two-thirds of the whole uterus. At puberty, its position is in the pelvis forming only one-third of the whole organ. In adult life, it is subjected to frequent trauma and exposure to infection. Then comes the changes due to pregnancy, parturition, and at last involution and rest set in. In old age, it is converted into a mere knob or dimple. The greatest of all these changes is that during parturition when, within a few hours' time, its canal, the calibre of which was only a few millimetres, becomes enormously stretched to allow the passage of the fœtal head. Naturally the mucous membranes are broken, muscles stretched and lacerated and the whole cervix thrown open to infection. In this small portion of the uterus there are four different varieties of epithelial lining from below upwards, *viz*, squamous, high columnar, transitional, and low columnar. It receives the watery alkaline secretion of the body of the uterus, forms a thick glairy mucoid secretion of its own and is bathed in the creamy acid secretion of the vagina—the importance of which is very little known. Lastly, its hidden situation and comparative insensitivity to pain, combined with the patience and shyness of the sex, favour any diseased condition progressing deeply before being complained of by the patient. When we consider the large amount of inconvenience, suffering and misery, often terminating in death, that arise out of the various kinds of disturbances originating in this small area, it would seem that, while much has been said and written, there still remains a lot to be done by those who are teachers and leaders in gynæcology and obstetrics.

At present the problems that confront the profession, particularly the specialists in obstetrics and gynæcology, are :—

(1) Is carcinoma of the cervix curable ?

(2) Is carcinoma of the cervix preventable ?

The answer to the first is qualified and conditional. It is admitted by all that with modern methods of treatment properly applied many, if not all, cases of carcinoma are curable. We know of cases of cure of 5 or even 10 years' duration but few of 20 years. It would be fair to say that improvement in the results following the treatment of carcinoma is to be obtained only if the cases are diagnosed in the early stage of the disease. In order to get them early, the cancer-consciousness of the medical profession as well as that of the general public must be properly awakened. To bring down the death rate of carcinoma of the cervix, much more is required than the sharpening of the diagnostic acumen of the family doctors and general practitioners. Of equal importance is the education of the public by allaying their fears, calming their prejudices and removing ignorance of which every part of India is full. This is on the whole a far more difficult problem which is not strictly within the scope of this discussion.

The other problem—Is carcinoma of the cervix preventable ? It sounds rather absurd for a disease to be called preventable when its real ætiology is still unknown. True it is that, despite strenuous research work, all over the world the real cause of cancer is still in darkness. I am not a pessimist in this respect and I hope some day, in the near future, some lucky man may find out the real cause of cancer like Schaudinn's discovery of the spirochæte. When we stop to consider that little more than sixty years have passed since the origin of cancerous growth has really been understood, we need not be discouraged with the progress that has already been made. The contribution to literature has been enormous and our knowledge has been much clarified regarding the predisposing factors, ætiology, gradation, prognosis and treatment of carcinoma.

Carcinoma of the cervix differs widely from carcinoma of the other regions of the body in its onset, behaviour, progress and response to treatment. It has been shown that the condition is preceded by pregnancy in over 90 per cent of cases. In other instances a history of inflammation, erosion or some instrumentation, such as dilatation, can usually be traced. Cervicitis and erosion are prone to follow laceration from child-bearing and the former may follow any instrumentation of the cervix. I think the important ætiological factor is not laceration but rather the consequent inflammation and chronic irritation.

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not had the opportunity of using existence of chloride porous pencils of Aleck Bou[illegible]ly difficult tinct advantage of this method is th[illegible] It is, howment can be safely carried out in th[illegible]ity. On redepartment. I have also had no[illegible]nostly contriconization of the cervix which [illegible]rican scientists, States is practised widely. [illegible]ner in which the

If the erosion is complicate[illegible] TeLinde (1933), cervix should be repaired. [illegible] 'pre-cancerous' it erosion is included in th[illegible]he incidence of carcithe remaining part has[illegible]ch cases is greater than erosion is complica[illegible] persons free from such a which has passed[illegible]rds, it is a condition develop-or the cervix i[illegible] of the healing of a very chronic degree of pro[illegible] or without laceration. K. V. will be [illegible]30), in his well-known paper on 'An Sturmd[illegible]into the basic cause and nature of the smo[illegible]al cancer and the relation between cervi[illegible]itis and cervical cancer', states :—

> Cervicitis or erosion of the cervix is definitely related to carcinoma of the cervix. This relationship is effected through the agency of a factor common to both, *viz,* an associated inflammatory exudate in contact with the epithelium. This is the intermediate causal factor and is constant. The basic cause of cervical carcinoma is to be found in this constant factor which is associated with all cell reaction, including that of cancer inception.

The line of junction of the squamous and columnar epithelium is usually at the external os. In practice, it is found that the cylindrical epithelium may extend to the outside of the cervix or the squamous epithelium may extend up into the canal, the line of junction being correspondingly placed. In the former, the glands which are situated outside the cervix are prone to become infected. In chronic cervicitis the muco-purulent discharge from the glands macerates the squamous epithelium, leaving a denuded surface with scattered islands of more resistant epithelium. This stage of inflammation is called erosion. The cylindrical epithelial lining, less susceptible to the inflammatory exudate, grows down over the raw area without changing its character. As the inflammation subsides the columnar epithelium, no longer bathed with mucus, loses its vitality, while the squamous epithelium regains its vigour. The latter grows back to its normal position on the outside of the cervix by proliferating under the edge of the cylindrical epithelium and gradually replacing it. If the cervix has been lacerated or everted some of the cervical glands are exposed to the vagina. In growing over the new external os at the edge of a laceration, the squamous epithelium surrounds and invades the ducts of the glands. Sometimes it fills a duct and forms a plug which may grow inwards for some distance, or, rarely, may extend beyond the area of erosion into the cervical canal and deep down into the muscle, involving normally-placed glands. This is called epidermization of the glands and ducts of the cervix.

When a cross section through such a part is seen under the microscope, a first glance gives the impression suggestive of carcinoma. In fact, it may be wrongly diagnosed as carcinoma by one not trained in gynæcological pathology and occasionally experts have been known to differ in their opinion as to the nature of these islands of squamous epithelium. In such an event, the guiding points for establishing a diagnosis of malignancy are :—

(1) breaking of the basement membrane;

(2) hyperchromatic and mitotic characters of the nuclei;

(3) irregular and indefinite cell outline;

(4) in contradistinction epidermization follows the gland outlines, *i.e.,* 'trellis-like network of the glands', instead of the haphazard invasion of malignancy.

Lastly, a detailed study of a series of sections will clear the salient features of benignancy or malignancy.

This process of repair does not always follow an orderly sequence. The chronic cervicitis may flare up and subside from time to time. The two types of epithelium are thus put into a state of restlessness, sometimes over a long period. In view of the unstable equilibrium of epithelial growth it is not at all unnatural that the latter may be excessive and thus encourage the development of carcinoma (Pemberton and Smith, 1929). Another point in favour of the view that the exudation of chronic cervicitis stimulates cancer formation is that patients with procedentia very rarely suffer from cancer of the cervix.

Leucoplakia of the cervix is another condition which predisposes to cancer formation. Leucoplakia was known long ago but its importance and frequency were not realized till Herr Hinselmann began to discover the small size of the areas by the aid of the colposcope. My experience of leucoplakia is very meagre as I have seen but few cases in my practice. They may be rare here or we might find them more frequently if the colposcope were used to detect them. In regard to its tendency to malignancy, some workers claim that leucoplakia of the cervix is not a pre-cancerous lesion. But Hinselmann (Davis, 1934) states that all leucoplakia observed for a long enough time has become malignant and he cites cases. The changes are seen mostly in the cells themselves and not in their invasive power.

The diagnosis of early cervical carcinoma is often difficult, but it means much to the patient as it gives her a relatively good chance for life. While chronic cervicitis, erosion and lacerations are considered as pre-cancerous, the superposition of any of the following conditions on them must raise suspicion of early carcinoma.

(1) A localized hard nodular feel. This must be distinguished from deep-seated, pent-up secretion under tension in a Nabothian follicle. Puncture with a surgical needle will settle the question. Sometimes, glairy fluid as much as two teaspoonfuls comes out.
(2) Indurated area on either lip, especially if the overlying surface is granular.
(3) Small ulcerated area.
(4) Extreme localized vascularity.
(5) Deposition of calcium salts.
(6) Friability of surface.

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It requires experience and careful speculum examination in good light to detect these conditions, while the application of Schiller's test and modern colposcopy are certainly additional aids involving finer technique in detecting them earlier.

Biopsy and microscopic examinations, however, are the only means of establishing the diagnosis with certainty. By histo-pathological examination diagnosis becomes easy in most of the cases, the condition being obviously benign or malignant. In some cases, however, the diagnosis is difficult, and in a very small percentage it may be almost impossible. By a careful weighing of the clinical history, a thorough local examination combined with the results of special tests, if possible colposcopy and where necessary biopsy and microscopy, carcinoma will rarely be overlooked even in its early stage.

Sometimes, objections are raised to biopsy on the grounds of (1) acceleration, (2) dissemination and (3) infection of the growth. Personally, I think the danger of spread by instruments is overrated. Even on theoretical grounds the danger can be minimized by searing the cut surfaces of the wound with a cautery. Biopsy is best performed with a sharp knife or punch. The tissue should be excised from the most suspicious area with a certain amount of healthy tissue retaining the mucous surface. A colposcope helps considerably in performing biopsy more perfectly and finely. After receiving the tissue it should be cut into three pieces and the pathologist asked to put them in one block. Thus a series of sections at three different levels is made and there will hardly be a chance of missing a suspected area. Excluding the competency of the pathologist, much depends on the surgeon for the result of the biopsy. The pathologist should be considered as a consultant and not a prophet. He should be supplied with all the available information in order to arrive at a right decision. In a doubtful case the opinion of a second pathologist should be sought. When two pathologists disagree regarding the diagnosis of a section from the cervix, it can be concluded with considerable assurance that the growth is benign. But the patient should be kept under observation and another section made two months later. It is here that close co-operation should exist between the clinician and the pathologist, neither of whom should be guided by preconceived ideas and prejudices in the study of cervices undergoing these chronic inflammatory processes. I think this would be the only possible means of finding out the link between pre-cancerous conditions and early carcinoma of the cervix.

Most treacherous, however, is an endocervical carcinoma. The portio vaginalis and external os look healthy. The cervix as a whole is bulky, spindle or barrel shaped. The endocervical mucous membrane is found to be vascular and granular, as determined by the passage of a sound. Only the curette and microscope will settle the

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Gynæcologists and obst rst is qualified and condi- with bigger problems and all that with modern this part of the question ly applied many, if trusted to the hands of a jure curable. We out-patient department. even 10 years'

As most of pre-cancerous con would be fair childbirth, the question of prophyl following Here, if my information be correct, th obtained is neither examined nor stitched for lacerage unless there is sufficient post-partum hæmorrhag from the torn area. In some clinics, lacerations of the cervix are treated as a routine measure. Personally, I think our practice is better as there is less risk of increasing the morbidity which is already too high in Bengal in comparison not only with other countries but also other provinces in India. But I would certainly emphasize the importance of examination of every puerperal woman once post-natally in the fourth to sixth week. This will reveal and give a chance to rectify many gynæcological affections, pre-cancerous conditions being some of them.

Treatment

Gynæcologists owe a lot to Hunner (Eden and Lockyer, 1935) who first used the cautery for the treatment of chronic cervicitis and erosion in 1906. He used the Paquelin cautery which was replaced by the nasal electric cautery by Dickenson. Cauterization of the cervix, if properly done, will save many lives and give comfort to a greater percentage of women than any other simple procedure in surgery. It must be emphasized, however, that it is an operation that must be performed properly, otherwise its results will be disappointing. This is true in the more chronic, deep-seated infections of the cervix, where there is a great excess of connective tissue and the glands lie far beneath the surface. In a moderately bad case cauterization has to be repeated a second or third time at an interval of four to six weeks. Just a word about cauterization—the linear cauterization of the canal must be done deep inside, gradually becoming superficial at the external os, otherwise eversion of the lips results after healing. The glands in the portio vaginalis are attacked by point puncture from the surface.

It is safer to hospitalize the patient for cauterization. Topical application of caustics, of which there are many, is useless, and is a mere waste of time, energy and money. It is sometimes beneficial in a limited number of cases in which the erosion is superficial and follows a recent labour or abortion. I have

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not had the opportunity of using the zinc-chloride porous pencils of Aleck Bourne—a distinct advantage of this method is that the treatment can be safely carried out in the out-patient department. I have also had no experience of conization of the cervix which in the United States is practised widely.

If the erosion is complicated by laceration the cervix should be repaired. Usually the area of erosion is included in the denudation. If not, the remaining part has to be cauterized. If the erosion is complicated by multiple laceration which has passed beyond the stage of repair or the cervix is very bulky and there is some degree of prolapse—low amputation of the cervix will be the treatment of choice. Either Sturmdorf or Bonney's method usually gives a smooth external os.

Radium.—In the treatment of chronic inflammation and erosion, my experience is very meagre.

Although it has not been proved scientifically that the treatment of the diseased cervix is a prophylactic against cancer formation, there are some suggestive facts in support of this. In a series of 3,814 trachelorrhaphies, 740 amputations and 1,408 cauterizations of the cervix, a total of 5,962 cases covering a period of 52 years at the Free Hospital for Women in Boston, only five were known to have developed cancer of the cervix and these were all in the trachelorrhaphy group. More convincing are the figures of Leuin, who in 613 cases of cancer of the cervix found only two in which a previous cervical repair had been performed. Thus, in these series not one patient whose cervical specimen was suspicious but not malignant has been found to have developed cancer.

My figures are too small to be compared with those mentioned above and my experience is not sufficiently mature to enable me to make a bold statement. I can, however, say that none of my pre-cancerous cervices treated on the above lines has developed cancer yet.

Hysterectomy.—For nearly a decade hysterectomy, particularly by the vaginal route, has been very widely performed here in fairly young women, the indication being pre-cancerous cervix. Of late the condition has gone from bad to worse, so much so that students of the present day put down pre-cancerous condition of the cervix as one of the indications for hysterectomy ! Literature fails to support this extreme view. I cannot trace the origin of this idea which has spread out like a conflagration and affected nearly all the specialists here. To be honest, I am not an exception to this craze. But the time has come when we should stop for a moment and review the results of our actions in the past and present and decide what should be done in future.

Can we say, we are justified in removing an organ so important to the sex because we are

(*Continued at foot of next column*)

STUDIES ON THE ACTION OF SYNTHETIC DRUGS ON SIMIAN MALARIA

Sulphonamide derivatives

By B. M. DAS GUPTA

and

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THE widely divergent results obtained by various workers concerning the possibility of the

(*Continued from previous column*)

unable to differentiate with certainty a non-cancerous from an early carcinoma stage ? Personaliy, I think hysterectomy should not be done for pre-cancerous conditions which can usually be cured. On the slightest suspicion of early malignancy, biopsy and microscopic examinations should be made to settle the diagnosis. In case of doubt one must wait, observe and see. As Ewing says ' It is not true that a pathological condition must be either cancer or not cancer. It may be neither the one nor the other '.

Trouble may arise from keeping a patient waiting for a long time in suspense. In such a case it is difficult, if not impossible, for the doctor to take his patient into his confidence and, in the happy event of a negative finding, it would be only human for the patient to protest with no uncertain voice that there had been a lot of fuss and considerable expense for nothing. It often happens that the doctor is more worried from the difficulty of trying to convince a patient and her relations that something ought to be done than by ignorance of what advice to give. Hysterectomy should be reserved for cases in which other methods of treatment are not possible and the pre-cancerous condition is complicated by other diseases, *e.g.*, fibroid, inflammatory adnexa, uncontrollable uterine bleeding and prolapse of the uterus after menopause, etc.

On the rare occasion, when hysterectomy is contemplated because of pre-cancerous conditions, it would be wise and safe to have a second opinion. By this means not only does the patient get a fuller benefit of professional opinion but the members of the profession are also mutually benefited.

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antimalarial action of prontosil led the present writers to try this drug in monkey malaria. Their *raison d'être* was that *Plasmodium knowlesi* is very suitable for testing the therapeutic effectiveness of a drug against malaria, for this plasmodium has been shown usually to produce an intense infection in *rhesus* monkeys causing the death of the animal if not promptly treated with a potent antimalarial remedy.

Experiment 1.—Monkey (*Silenus rhesus*), 2.420 kilogrammes in weight. On 2nd August, 1938, it was inoculated with 0.5 c.cm. of heavily infected blood showing rings and growing trophozoites.

Date	Parasites per c.mm. of blood	Treatment	Remarks
8-8-38	..	..	Very scanty parasites seen in thick films.
9-8-38	12,380	..	Growing trophozoites and schizonts.
10-8-38	138,000	Prontosil soluble intra-venously 0.5 c.cm.	Chiefly rings and a few growing forms.
11-8-38	184,000	Do.	Nearly all stages of schizogony present.
12-8-38	1,200,000	Do.	Monkey very ill.

Died at 3-30 p.m.

Smears of heart blood, spleen and liver crammed with parasites and pigment-bearing mononuclears.

Experiment 2.—*Silenus rhesus* weighing 4.224 kilogrammes, inoculated with 1 c.cm. of heavily parasitized blood. Incubation period 5 days.

Date	Parasites per c.mm. of blood	Treatment	Remarks
10-8-38	Scanty rings	..	
11-8-38	9,260	..	Only ring forms.
12-8-38	68,400	Prontosil soluble intra-venously 1 c.cm.	Chiefly rings and a few mature schizonts.
13-8-38	312,000	Do.	Growing trophozoites, schizonts and a few gametocytes.
14-8-38	880,000	Do.	Monkey very anæmic. Blood showing normoblasts. Howell-Jolly bodies, poly-chromatophilia, demilune cells, etc.
15-8-38	Animal died at night.		Autopsy was not done.

Experiment 3.—*Silenus rhesus* weighing 2.528 kilogrammes, inoculated with 1 c.cm. of blood from the monkey of experiment 2 when the latter showed a parasite count of 68,400 per c.mm. Incubation period 4 days.

Date	Parasites per c.mm. of blood	Treatment	Remarks
16-8-38	..	..	Very scanty parasites in thick smears.
17-8-38	18,400	..	Rings only.
18-8-38	120,000	Prontosil soluble intra-venously 3 c.cm.	Trophozoites, schizonts and scanty gametocytes.
19-8-38	448,000	Do.	Trophozoites and a few schizonts.
20-8-38	88,400	Do.	Marked anæmia. Total R. B. C. 1,800,000.
21-8-38	Scanty	Do.	Large mononuclears with ingested hæmozin pigment and degenerating parasites.
22-8-38	0	Do.	

The blood was examined almost daily until 17th September: scanty rings were found on 28th and 31st August and on 14th to 17th September. On 27th August the animal was well and the red blood count was over 6 millions.

Comments.—After 3 heavy doses amounting to 9 c.cm. had been given, the infection was practically eradicated. Very scanty parasites, however, appeared on the ninth day after the treatment had been discontinued and a low-grade infection has persisted since. It may be mentioned here that after the apparent extinction of the infection (with *P. knowlesi*) following the treatment with quinine or atebrin, the parasites appear again in the blood. In the case of quinine, however, scanty infection may persist for some weeks or even months, and eventually clears up. But with atebrin the state of affairs is quite different, that is, the initial infection is checked much more quickly than with quinine or prontosil, but the relapse is often of a severe nature, associated with rapid multiplication of the parasites leading to fatal termination, if the animal is not promptly treated. It thus appears that the action of prontosil in monkey malaria is more like quinine than atebrin.

Discussion

Díaz de León (1937) was the first to lead the experiment with sulphonamide in malaria. He treated 15 cases of *P. vivax* with a dosage of 6 tablets of Rubiazol* daily for 4 days, and then 3 tablets a day till the contents of one bottle (quantity not specified) were exhausted.

* Rubiazol is the French name of prontosil.

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Only in one severe case he had recourse to an injection of 10 c.cm. of a 5 per cent solution in addition to the oral administration mentioned above. All his cases recovered.

Hill and Goodwin (1937) successfully treated 5 cases of *P. vivax* and 95 cases of *P. falciparum* with intramuscular injection of prontosil soluble (10 c.cm.) every twelve hours. Usually, not more than 4 injections were required in each case. Their results were very satisfactory.

Read and Pino (1938) dealt with 3 cases of *P. vivax*. The initial doses were 6 tablets (1.8 grammes) in 24 hours. Afterwards the dosage was reduced to 3 tablets a day. The patients who were suffering from distressing vomiting had intramuscular injections of prontosil soluble. They noted that sulphonamide has a poor specific antimalarial action because it has neither a sufficiently definite action on the schizogony cycle, nor is it a remarkable gametocide.

Very recently Pakenham-Walsh and Rennie (1938) treated a case of induced malaria (*P. vivax*) with prontosil. They gave 3 grammes of prontosil daily for 3 days. The temperature came down and the parasites cleared up, but a week later the fever relapsed and the parasite counts were nearly as high as in the original attack.

The failure of the latter workers may be due to the use of inadequate dosage, as is apparently confirmed by our experiments on monkey malaria. It will be seen from the experiments detailed above that a daily dose of 0.5 c.cm. was given to the first monkey as this was considered to be the proportionate dose, regard being had to the comparative weights of man and monkeys. This dose being of no avail, it was doubled. As this also failed we at last tried a still larger dose of 3 c.cm., which is overwhelmingly out of proportion to the human dose, and this succeeded in checking the course of the disease, leading to apparent recovery of the animal, although scanty parasites appeared in the blood later on, as also occurs following treatment with quinine.

To sum up, doses of 0.5 and 1 c.cm. altogether failed to check the multiplication of *P. knowlesi* in *rhesus* monkeys. But the disproportionately heavy dosage of 3 c.cm. proved effective. We may conclude, therefore, that prontosil in heavy doses has a definite action on plasmodial infections (at least on the monkey plasmodium), but does not possess any advantage over those drugs already in use.

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STUDIES ON THE ACTION OF SYNTHETIC ANTIMALARIAL DRUGS ON INDIAN STRAINS OF MALARIA

Cilional in the treatment of 'crescent carriers'

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Cilional was introduced by Schulemann of Messrs. Bayer-Meister-Lucius, Germany, a few years ago. It belongs to the plasmochin series of preparations and has the composition di-alkyl-amino-alkyl-amino-oxy-quinoline. Its action on the gametocyte of *Plasmodium falciparum* was claimed to be as potent as that of plasmochin, in doses far less than any that produced toxic symptoms.

A total dose of 0.18 to 0.3 gramme (in daily doses of 0.06 gramme) proved sufficient to make the crescents disappear from the peripheral blood. Atebrin was also given at the same time to control the asexual cycle. Regarding the toxicity of the drug, the makers have stated, after a series of experiments in mice, guinea-pigs, rabbits and cats, that it is about three times less toxic than plasmochin. Clinical trials on human beings have fully supported these findings. Daily doses of three times 0.01 gramme up to three times 0.06 gramme have been borne without toxic effects. Even the last-mentioned dose has been given for seven days without causing any subjective symptoms.

Missiroli and Mosna (1938) have recently treated a series of *P. falciparum* gametocyte carriers with varying doses of cilional. The gametocytes were enumerated, flagellation was looked for, and the infectivity of the blood for anophelines was determined each day for a week following the administration of the drug. A field experiment was also carried out with a population of about 1,000 individuals where malaria was hyperendemic. From 1st May to 15th October, 1937, cilional was given to the whole population including infants and children every three days in doses ranging from 1 to 6 cgm. These workers conclude that in respect of its toxicity the drug is far superior to plasmochin and that addition of such a drug to quinine or atebrin will give a complete antimalarial remedy.

As Chopra and Basu (unpublished) have noted that daily doses of 0.06 gramme for four days were not sufficient to check the development of the parasite in the mosquito, we tried a larger dose, *i.e.*, 0.09 gramme daily for five days in the following cases.

Patient I., aged 28 years, admitted to the hospital on 12th August, 1938, with a history of fever for three

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days only. On the day of admission quite a good number of rings (*P. falciparum*) were found. On 13th August the patient was given prontosil, 2 tablets four times daily for 5 days. Rings were completely eradicated and gametocytes appeared for the first time on 16th August.

Date	Total dosage of cilional	Crescents per 500 leucocytes	Remarks
16-8-38	..	3	
17-8-38	..	42	
18-8-38	..	43	
19-8-38	0.09 gramme	85	
20-8-38	0.18 „	64	
21-8-38	0.27 „	20	
22-8-38	0.36 „	3	Very scanty parasites present, showed marked degenerative changes.
23-8-38	0.45 „	0	One parasite seen in the thick film.
24-8-38	..	0	
25-8-38	..	0	
26-8-38	..	0	
30-8-38	..	0	

Comments.—This is apparently a case with fresh infection as the patient is said to have had no febrile attacks during the past few years. Prontosil controlled the schizogony cycle, but it had no action on the gametocytes. Crescents made their first appearance in the blood about the eighth day of the initial fever. We may attribute the gradual reduction in number and finally the complete eradication of the gametocytes to the effect of cilional, as it seems unlikely that in a primary infection the crescents would disappear with such unusual rapidity. It should be noted that after the treatment with cilional there is a definite increase in the number of crescents followed by a marked decrease culminating in total extinction.

Patient P., aged 38 years, admitted on 9th August, 1938, for pain in the abdomen. History of fever (? malaria) two months back. Spleen not palpable. While in hospital, he had an attack of fever with rigor on 16th August. Next day a fair number of rings and crescents were found in the blood. Put on to atebrin on 18th August for 5 days. On 21st August blood showed crescents only.

Date	Total dosage of cilional	Crescents per 500 leucocytes	Remarks
23-8-38	..	62	
24-8-38	..	76	
25-8-38	0.12 gramme	362	
26-8-38	0.18 „	8	
28-8-38	0.36 „	0	Very scanty crescents found in thick films.
29-8-38	0.45 „	0	
30-8-38	..	0	
31-8-38	..	0	

Comments.—This is a case of relapse. Both sexual and asexual forms were present in the blood. Atebrin eradicated the asexual cycle. A total dosage of 0.36 gramme of cilional practically exterminated the crescents, although there was a surprisingly remarkable rise in the crescent count after the administration of the first few doses.

Patient C., aged 16 years, admitted on 23rd August, 1938, with a history of intermittent fever with rigor for a month. Spleen just palpable. On the day of admission, the blood (thick and thin films) showed crescents only.

Date	Total dosage of cilional	Crescents per 500 leucocytes	Remarks
23-8-38	..	95	
24-8-38	..	100	
25-8-38	0.12 gramme	82	
26-8-38	0.21 „	118	
27-8-38	0.3 „	6	
28-8-38	0.39 „	0	None in thick films.
29-8-38	0.45 „	0	
30-8-38	..	0	

On 31st August, 1938, the patient had a slight rise of temperature. Scanty rings and no crescents were found in the thick films. Put on to prontosil 2 tablets four times a day for 5 days.

1st September .. Rings: no crescents.
2nd „ .. Scanty rings: no crescents.
3rd „ .. Very scanty rings: no crescents.
4th „ .. Very scanty rings in thick films: no crescents.
5th „ .. No parasites seen in thick films.

Comments.—This is a chronic case showing only crescents in the blood. No asexual forms could be detected even in thick films on careful search. Crescents completely disappeared after a total dosage of 0.39 gramme. Almost immediately after receiving a full course of cilional the patient had fever, blood smears showing only rings. He was put on prontosil which apparently checked the fever and the infection gradually cleared up. Evidently cilional did not show the slightest action on the schizogony cycle in this case.

Patient R., aged 22 years, admitted on 25th August, 1938, with a history of fever (? malaria) for one year. Spleen 2 inches below costal margin. Blood on admission showed both rings and crescents. On 26th August, put on to prontosil for 5 days. On 30th August, crescents only were seen in the thick and thin blood films. On 2nd September, 1938, put on to cilional 0.03 gramme three times a day for 5 days.

Date	Total dosage of cilional	Crescents per 500 leucocytes	Remarks
30-8-38	..	120	
31-8-38	..	92	
1-9-38	..	385	
2-9-38	..	380	
3-9-38	0.12 gramme	408	
4-9-38	0.21 „	80	
5-9-38	0.3 „	32	Mostly degenerating.
6-9-38	0.39 „	15	
7-9-38	0.45 „	0	
8-9-38	..	0	

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Comments.—Before the administration of cilional the crescent count did not show any downward tendency but the infection practically cleared up after a total dosage of 0.39 gramme.

Discussion.—Those concerned with the treatment of malaria are agreed that plasmochin has a very markedly destructive action on the gametocytes of *P. falciparum*. On the other hand, most of them complain of its toxicity. Further, the toxicity appears to be a phenomenon of individual susceptibility rather than one of dosage. One cannot ascertain beforehand whether a particular patient will or will not develop toxic symptoms.

Knowles and Das Gupta (1931) have, however, found that the dosage advocated by the manufacturers was unnecessarily large and a much smaller dose could eradicate the crescents from the blood in the case of the Indian species of *P. falciparum*. These workers showed that a total dose of 0.06 gramme (0.02 gramme daily for 3 days) was sufficient to destroy all crescents, even when the infestations were heavy and the cases treated with such a small dosage, under their observation, never developed any untoward symptoms.

The destructive action of plasmochin on crescents may be studied under the microscope. Within 24 hours of commencing administration of plasmochin the crescents are seen to become swollen and their outline irregular, and the chromatin breaks up.

Whitmore (1929) stated that a single dose of .019 gramme is sufficient to render non-infectious, for *A. albimanus*, all crescents in the blood at the time the single dose is taken. Lately, Chopra and Basu (1937) also made similar observations and found that a dose of .02 gramme prevented further development of the crescents in *A. stephensi*. Since 1931 the senior author has treated no fewer than 500 crescent carriers in the Carmichael Hospital for Tropical Diseases with plasmochin, using the small dosage advocated by Knowles and Das Gupta (1931). In no case were there any toxic symptoms exhibited by the patient, nor was there any evidence to show that this small dose had ever failed to exterminate the crescents. Under these circumstances the question of toxicity of plasmochin does not arise when it is administered in proper doses, at least in this country. On the other hand, cilional, as will be seen from the foregoing tables, requires a much larger dose and longer time to achieve the same result. It therefore follows that there is no justification for using cilional in place of plasmochin which has acquired an unchallenged reputation for its action on crescents.

Summary and Conclusion.

A total dosage of 0.35 to 0.4 gramme of cilional, administered as a dose of 0.03 gramme

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THE ISOLATION OF *VIBRIO CHOLERÆ* FROM NON-CHOLERA INDIVIDUALS

By C. L. PASRICHA
MAJOR, I.M.S.
M. N. LAHIRI
and
P. C. DAS

(*From the Cholera Bacteriological Enquiry, Indian Research Fund Association, School of Tropical Medicine, Calcutta*)

ALTHOUGH there are many records of the finding of vibrios in the stools of healthy individuals, there is no means of establishing whether the strains isolated were those conforming to the vibrio now generally accepted as *Vibrio cholerœ*. Recent work on the antigenic structure of vibrios has shown that *V. cholerœ* possesses a specific 'O' antigen and that the thermo-labile 'H' antigen is shared by a large group of vibrios. The important practical application of these findings is that, because of this inter-relationship that exists between *V. cholerœ* and certain other vibrios through common antigenic factors, it is no longer possible to rely, as was formerly done, on an agglutination test performed with an H and O serum for the identification of *V. cholerœ*. Serologically, *V. cholerœ* can be distinguished from certain other vibrios by agglutination test performed with a pure O serum.

During the past five years the stools of more than 2,000 in-patients in the Carmichael Hospital for Tropical Diseases have been examined for vibrios. The individuals examined were suffering from a variety of diseases, other than cholera, and there was no history of either a

(*Continued from previous column*)

three times a day, is usually sufficient to eradicate practically all gametocytes of *P. falciparum* from the blood and even this high dose has been borne by the patients experimented upon, without any ill effects.

On considering the points discussed above we cannot, however, help arriving at the conclusion that plasmochin is preferable to cilional, inasmuch as a much smaller dose of the former effects the eradication of crescents in a comparatively short time, and as the dosage of plasmochin (as advocated by Knowles and Das Gupta) is not at all toxic and perhaps cheaper than its rival.

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recent attack of cholera or contact with the disease. Vibrios were found in a certain percentage (the highest being about 10 per cent) of these individuals. The vibrios isolated were all inagglutinable with cholera O serum. About 20 per cent of the vibrios from non-cholera individuals were agglutinable, often to full titre with cholera H and O serum. In the first half of this year, *V. choleræ, i.e.,* vibrios agglutinable with cholera O serum, were isolated from three individuals.

The examination of the stools for vibrios was carried out after a two-stage enhancement in peptone water and isolation on Aronson's medium.

Brief notes of the individuals from whom *V. choleræ* was isolated are given below :—

No. 1.—Hindu male, aged 22, resident of Punjab. In Calcutta for 2½ months before admission for ill-defined abdominal symptoms. Examined twice and vibrios found only once on 12th April, 1938, the day after admission to hospital.

No. 2.—Mohammedan male, aged 16, resident of Calcutta (Tollygunge area), admitted for chronic diarrhœa and progressive weakness. Vibrios isolated on 12th April, 1938, the day after admission.

No. 3.—Mohammedan male, aged 15, resident of Calcutta (Entally area), suffering from malaria. History of an attack of dysentery six months prior to admission but there were no gastro-intestinal symptoms on admission. Examined twice and vibrios found once (24th May, 1938) on the first day after admission.

The vibrios isolated were typical monoflagellate vibrios, biochemically of Heiberg's group I. They were agglutinable to full titre with cholera (Inaba) 'O' and H and O serums and were not agglutinated by a pure Ogawa serum. They produced no hæmolysis of goats' red blood cells. They were not phage-contaminated and were acted upon by the different types of cholera-phage.

Unfortunately, it was not possible to make further examination of these three individuals at the time of isolation of the vibrios. They were traced after discharge from the hospital and none of them developed cholera. It will be noted that the three individuals came from different parts of Calcutta and that the vibrios were isolated from the first stool examined after admission to the hospital, and that the second examination of the stools was negative in all three. This suggests that the infection had been acquired outside from different sources.

Summary

The isolation of *V. choleræ, i.e.,* vibrio agglutinable to full titre with cholera O serum, from three non-cholera individuals is recorded. From the results of the examination of a series of 2,000 stools it appears this finding is of extreme rarity.

BLOOD CULTURE IN CHOLERA

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and
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GREIG (1914) found vibrios in many organs at post-mortem examination, but failed to isolate vibrios from the blood during life. We are not aware of any further attempt to examine the blood of cholera patients for the presence of vibrios. As opportunity existed for examining a series of patients the blood of 26 cholera patients was examined for the presence of vibrios. This examination was carried out during the height of the cholera season, all the patients had typical cholera symptoms and in all *V. choleræ* was subsequently isolated from the stools.

The blood was collected as early as possible after onset of symptoms. In two patients the blood was collected 3 hours after onset, in four 4 hours, in four 5 hours, in five 7 hours and in five 9 hours. In twenty of the patients therefore the blood was collected within 9 hours of the onset of symptoms, in the remaining six after longer periods. Approximately 5 c.cm. of blood was withdrawn under the usual aseptic conditions and inoculated into a bottle containing 100 c.cm. of peptone water. A few drops of the blood were also seeded on to nutrient agar. There was no growth of any organism from any of the samples.

Summary

Blood of 26 cholera patients was examined for the presence of vibrios. The blood was collected as early as possible in the disease, in 20 patients within 9 hours after onset of the symptoms. Vibrios were not isolated from any of the samples; this confirms Greig's findings.

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VIBRIOS FROM CERTAIN NON-HUMAN SOURCES

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VIBRIOS which in their biochemical activities resemble the *Vibrio choleræ* but differ from it in their thermo-stable O antigen have been isolated from various sources. Recently, Pasricha, Chatterjee and Das (1938) found such vibrios in the majority of the samples of Calcutta surface waters examined by them; and the vibrios were present also on the bodies of flies and cockroaches. In the present report the results of the examination of stools of a series

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of certain domestic and laboratory animals are recorded.

Freshly-passed fæces of the animals were collected and enhanced through two peptone-waters. The first enhancement was carried out in a flask containing 150 c.cm. of 1 per cent peptone-water and after incubation overnight one c.cm. from each flask was transferred to a tube containing 10 c.cm. of peptone-water. This was incubated for six hours and the surface growth plated on Aronson's medium. It is interesting to note that better results were obtained on Aronson's medium than on bile-salt agar which medium gives better results with cholera stools.

Samples of stools from 195 animals of 13 different species were examined. The results are shown in table I.

TABLE I

The results of the examination of the stools of different animals for the presence of vibrios. Fifteen animals of each species were examined

Animals	Number of animals in which vibrios were isolated	Percentage of animals in which vibrios were recovered
Horse ..	10	67
Mule ..	Nil	..
Buffalo ..	8	53
Cow ..	7	47
Sheep ..	3	20
Goat ..	2	13
Pig ..	7	47
Mice ..	Nil	..
Rats (white) ..	2	13
Guinea-pigs ..	6	40
Rabbits ..	1	7
Monkeys ..	8	53
Cats ..	Nil	..

The results of the examination of single specimens show that except for mules, mice, and cats, vibrios are found in the stools of the majority of the animals. The stools of the laboratory animals were examined daily for seven days and it was found that the isolation of vibrios was extremely irregular. Further samples of stools of cats and mice were examined but with negative results.

Seventy-five strains of vibrios were studied in detail. All were inagglutinable with cholera 'O' serum (Inaba), 33 or 44 per cent were agglutinable to full titre with cholera 'H' and 'O' serum. Biochemically 41 strains were of Heiberg's group I, 32 of group II and one each of group III and group VI. Fifty-four of the 75 strains produced indole and 16 strains hæmolysed sheep's red blood corpuscles.

A search was made for the presence of bacteriophages active on the strains of vibrios isolated from the animals. A series of fifty samples of stools were examined both by the direct method and after repeated passage of the

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SOME EPIDEMIOLOGICAL FEATURES OF PLAGUE IN BENGAL WITH SPECIAL REFERENCE TO CALCUTTA

By S. RAGHAVENDER RAO, L.M.S. (Hyd.), D.T.M., D.P.H. (Cal.)

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No detailed information regarding pestilences in Bengal is available before the Mohammedan period. Farishta, a contemporary of Akbar, mentions the occurrence of bubonic plague in Bihar in 1548.

A very devastating pestilence ravaged Gaur*, the medieval capital of Bengal, in 1573. During this epidemic 'Thousands died daily; living were wearied with burying the dead. Corpses of Hindus and Mohammedans were thrown into the swamps, the tanks and into Bhagirathi. This created the stench which only intensified the disease. The few people that survived the plague left the city, which was never again populated to any extent' (Lambourn, 1918). Akbar's General, Munim Khan, who had been specially deputed to drive away Daud Khan

* This place is situated in the present-day district of Malda.

(*Continued from previous column*)

stool filtrates on vibrios isolated from the samples. Bacteriophages active against vibrios isolated from the animals were not found in any of the samples. Eight of the fifty samples of stools showed the presence of choleraphage, the predominating type being choleraphage type A. The choleraphages isolated were feeble in their activity and were found irregularly, suggesting that they are present as contaminants in the animals.

Summary

The stools of certain domestic and laboratory animals were examined for the presence of vibrios. It was found that vibrios are present in the majority of the animals. Vibrios were not found in the stools of mules, cats, and mice.

The vibrios isolated resembled *V. cholerœ* in their morphology and biochemical reactions, but differed from *V. cholerœ* in being inagglutinable with pure 'O' serum. Forty-four per cent of the vibrios from animals were agglutinable to full titre with cholera H and O serum. This stresses the importance of the cholera 'O' serum in the diagnosis of *V. cholerœ*.

Bacteriophages active against the vibrios isolated from the animals were not found in a series of fifty stools. This with the irregular isolation of vibrios from the stools of laboratory animals suggest that vibrios are present in the stools of animals as contaminants.

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from Bengal, also died of this disease. As to the nature of the disease which appeared in such a severe epidemic form, there is considerable controversy. The modern historians in Bengal generally believe this to have been malaria. Creighton (1817) believes it to have been plague. No reference to the appearance of buboes in this epidemic is to be found anywhere. At the same time it is to be remembered that plague was prevalent in northern India at this time.

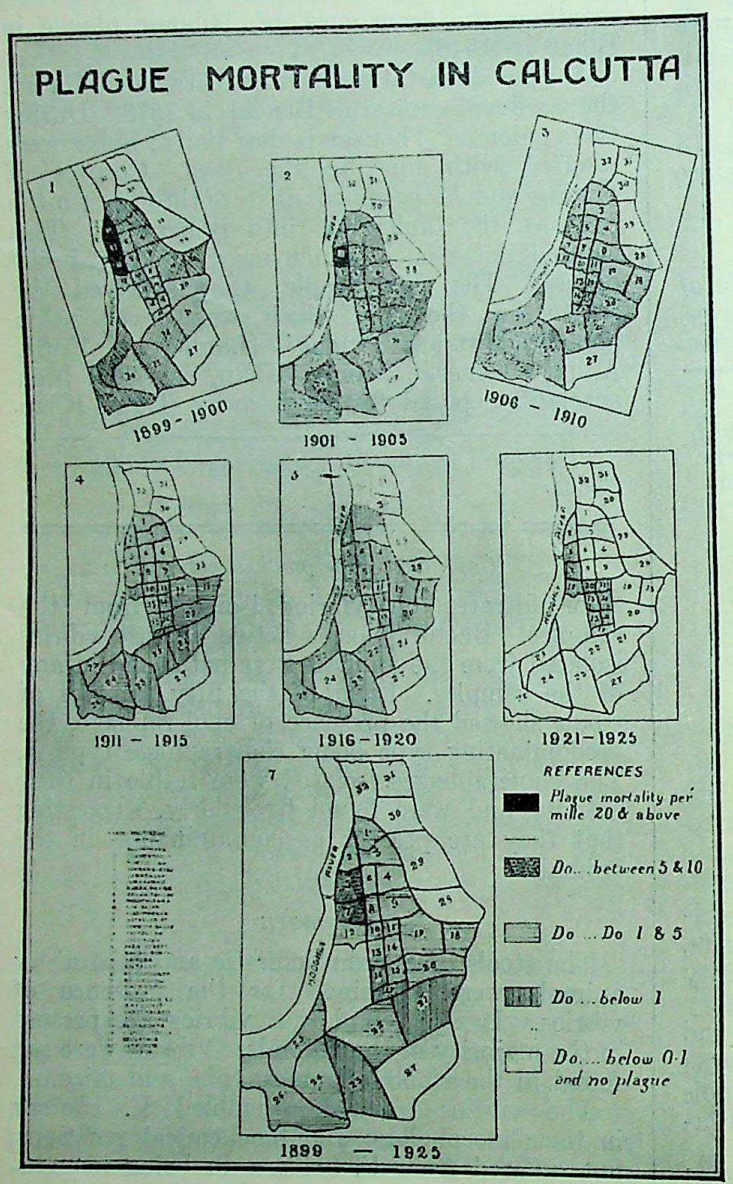

Fig. 1.—Plague mortality in Calcutta from 1899 to 1925.

It is not impossible that the infection was introduced by the invading army into a non-immune population with such devastating results. Further, recent experience in Bengal outside the city of Calcutta is that usually the cases are either of septicæmic or of pneumonic type. Possibly this fact explains the absence of buboes during the epidemic at Gaur.

A number of European writers have mentioned Calcutta city from time to time, but with regard to the incidence of plague in the eighteenth century unequivocal statements are lacking. The earliest reference to a pestilence resembling plague in Calcutta occurs in *Transactions in Bengal* and it relates to 1770. The following passage from it, quoted by Cook (1900), gives a good description of this epidemic :—

'There was not a corner in the city or any lurking place in the vicinity of Calcutta where the living, the dying and the dead were not mingled or heaped together in melancholy confusion. The daily employment of hundreds was to remove the dead in proportion as they became a nuisance to the public'.

There is nothing in the description to identify the disease with plague, but the unusually high mortality of 76,000 within a period of two months suggests an extremely fatal disease like plague. Again, Dr. Ling in his book *Tropical Diseases* gives his experience of a prevailing sickness in Calcutta, which probably refers to the epidemic of 1770, in the following words :—

'If the season be very sickly some are seized with a malignant fever of which they soon die. The body is covered with blotches of a livid colour and the corpse in a few hours turns quite black and corrupted'.

The statement recalls description of the Black Death in England by Defoe, which is generally accepted as plague.

More definite evidence of incidence of plague in Calcutta in 1780 is in Busteed's (1908) *Echoes from Old Calcutta*. He says—

'Diseases of a mysterious kind seem to have occasionally appeared and claimed their victims. The local purveyor of news records in perplexity in August 1780, "We learn that several people have been suddenly carried off within these few days by tumours in the neck, symptoms of a very unusual nature"'.

Death in a few days by 'tumours in the neck' suggests plague and the fact that the years (1770, 1776 and 1780) are all close to one another seems to strengthen the case in favour of the disease being plague.

Toynbee (1888) refers to a severe outbreak of a deadly malady at Chandernagore, which Dr. Wise, the Assistant Surgeon, investigated and pronounced it to be a kind of fever. It caused considerable panic among the local inhabitants, who believed that it was plague. Here again the nature of the disease is in doubt. However, the possibility of its having been septicæmic plague cannot be excluded.

This brings us to the last pandemic of plague in Bengal, which is generally believed to have started in 1898, the infection being introduced from Bombay. The first case officially

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recognized as plague was in April 1898. However, a careful perusal of records available leaves no room for doubt that the introduction of this disease into Calcutta city must have occurred at least three years earlier and that it took place independently of Bombay. A portion of the Shropshire Regiment arrived in the city from Hongkong in 1895. They had, while in Hongkong, been employed on duties in connection with plague preventive measures. Two men of the regiment died of plague in Hongkong. In Calcutta there occurred among these soldiers several cases of fever with buboes, but with no mortality. Venereal infection was definitely excluded. Authorities, however, were reluctant to admit them as cases of plague. A few cases which occurred in 1896 and 1897 among the civil population were considered by the Health Officer, Dr. Simpson (1897), to be plague cases, but the Medical Board discredited his bacteriological findings and declined to accept them as cases of plague. Dr. Simpson also drew attention to the mortality of rats in large numbers in grain godowns. At the same time the local practitioners stated that they came across cases of fever with enlarged glands in the civil population. Some of these cases ended fatally. All these indications of a slowly developing infection in the community however went unheeded.

An extract from the Editorial article of the *Indian Medical Gazette* (January 1897) is, in this connection, particularly illuminating as regards the attitude of the authorities :—

'We had no intention of referring to the Shropshire Regiment, but as the Medical Board have published the fact that cases of non-venereal buboes have occurred among the soldiers of that regiment, we cannot help remembering the fact that they came from Hongkong at the beginning of 1895; that they were very active in attempting to stamp out the plague; that fatal cases occurred amongst them; and that they have suffered from non-venereal buboes ever since; and it is a significant fact that it is only since the Shropshire Regiment came from Hongkong that difficulties in diagnosis regarding these buboes appear to have arisen . . .

The attitude of the Medical Board is easily understood, and from many points of view, especially the commercial, appears to be laudable; but when viewed from a wider aspect, it is a short-sighted policy, and not likely to be in the best interests, either of the public or even of the mercantile community. We have an example in Bombay of a similar policy as that pursued by the Medical Board and its results. Bombay concealed its first cases, then minimized them, and now it is face to face with a severe

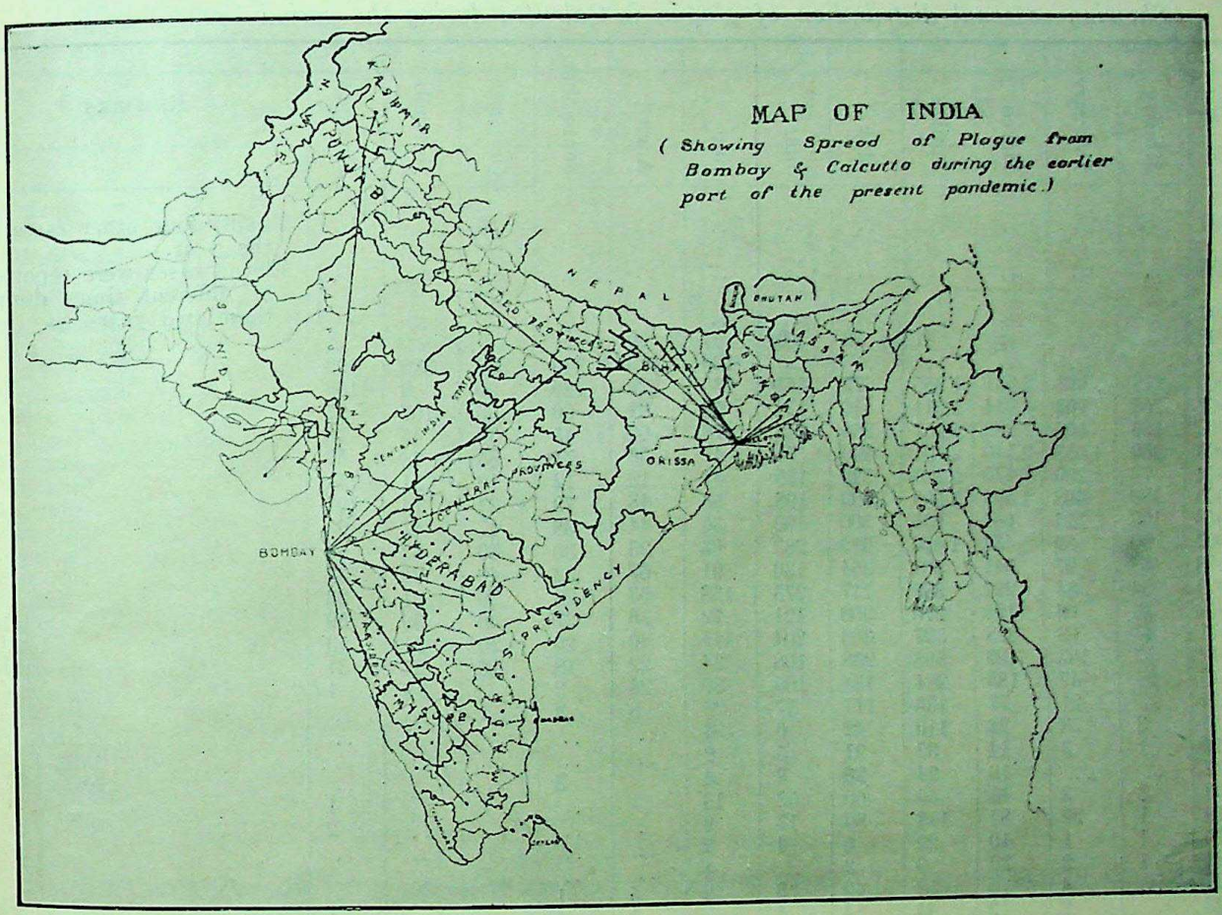

Fig. 2.—Map of India showing spread of plague in India during the earlier part of the pandemic with Calcutta and Bombay as separate sources of infection.

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epidemic, its trade is ruined, and by its flying population it is likely to spread the disease far and wide'.

This brief presentation of some of the available evidence suggests that the disease in question must have been plague. In all probability plague was introduced into Calcutta about 1895, independently of Bombay, and the disease appears to have had such a very mild course during the two or three years that even the nature of infection was not correctly diagnosed. The disease which was more or less smouldering for these three years suddenly flared up during the first quarter of 1898. Rat falls were noticed in the middle of April 1898 in a printing house on the riverside in ward VII and in the course of three or four days other localities in the neighbourhood also became involved. On 17th April, 1898, a corpse was discovered by the police in Kapalitola Lane; on post-mortem examination death was discovered to be due to plague. The diagnosis of this was confirmed bacteriologically. Within a week, several cases were reported not only from the neighbourhood of Kapalitola Lane but also from wards situated at a distance from it, *viz*, Shampookur (ward I), Coomartooly (ward II), Burra Bazar (ward VII), Colootola (ward VIII), Fenwick Bazar (ward XIII), and Beniapukur (ward XX). Calcutta city was officially declared infected on 30th April, 1898. This announcement is said to have created such a panic that people rushed away from Calcutta and in their hurry to leave the city, a number of lives were lost at the railway station due to stampede.

Then the extension of the disease took place both in respect of the period of the year and in the area involved with the result that by the year 1900 cases occurred throughout the year, and no part of the city was free from infection, as may be seen from the accompanying table and the map. This, however, did not last long and in 1907 the tide turned. The intensity of the epidemic gradually diminished and the part of the year when cases occurred became more and more restricted, and the area involved diminished year by year being more and more confined to the northern wards of the city, *viz*, wards V, VI, VII and VIII. Finally, the disease virtually disappeared from the city of Calcutta in 1925. From the districts it had disappeared much earlier as will be seen later.

Thus, we see that the fugitives from the city of Calcutta were responsible for the introduction

TABLE I

Showing seasonal distribution of plague in Calcutta during the period 1895 *to* 1926

Year	January	February	March	April	May	June	July	August	September	October	November	December	REMARKS
1895	2	..	..	..	..	..	..	..	..	10	..	..	Twenty-four other cases in the year.
1896	..	..	..	..	..	..	..	..	..	..	..	..	Eleven cases were reported at different times during these two years.
1897	..	..	..	..	..	..	..	..	..	..	..	..	
1898	..	..	..	41	32	69	57	29	11	..	..	..	
1899	..	..	..	..	..	..	120	322	349	368	380	490	
1900	218	653	3,631	1,855	672	451	230	229	229	90	9	108	
1901	263	703	3,944	2,011	416	174	58	91	60	66	107	97	
1902	169	506	2,282	2,457	1,266	248	78	69	45	35	45	78	
1903	260	1,058	3,140	2,801	499	71	47	56	74	83	78	57	
1904	73	290	1,170	2,293	529	159	44	19	12	12	31	71	
1905	186	408	1,503	3,509	1,093	198	58	48	70	24	74	101	
1906	103	124	684	935	306	190	36	44	38	47	47	63	
1907	60	89	454	1,420	972	283	63	26	30	30	82	80	
1908	58	97	341	501	364	130	91	67	32	40	28	32	
1909	64	84	294	386	717	273	138	53	28	36	21	23	
1910	36	66	195	276	300	121	72	36	27	36	39	59	
1911	47	63	218	597	366	204	111	40	26	20	31	13	
1912	57	183	499	598	238	108	34	22	18	16	27	31	
1913	21	47	188	284	134	106	39	24	3	...	5	1	
1914	..	21	77	136	111	57	28	8	3	1	..	..	
1915	3	3	22	110	42	6	4	..	..	..	1	..	
1916	1	3	14	32	21	5	2	..	..	..	..	..	
1917	..	..	16	24	26	8	4	..	3	..	..	..	
1918	3	3	16	49	66	52	18	1	..	1	..	1	
1919	1	29	82	118	80	13	9	..	..	..	..	2	
1920	1	1	10	29	6	4	2	..	..	..	..	..	
1921	1	2	22	9	2	..	1	..	..	..	..	..	
1922	..	4	16	52	49	8	9	5	1	..	..	..	
1923	..	2	13	44	14	1	..	1	1	..	..	1	
1924	1	1	5	8	15	2	1	..	..	..	..	..	
1925	1	..	..	..	1	2	5	..	..	..	..	..	
1926	..	..	..	..	..	..	..	..	..	..	..	..	

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of plague into almost all districts in Bengal and also of what now constitutes the two provinces of Bihar and Orissa. The accompanying map of India shows the extent to which the plague spread in India with Calcutta and Bombay as separate sources of infection.

In the presidency of Bengal, outside the city of Calcutta, the plague infection was unable to take a deep root. In several cases it only resulted in small outbreaks of pneumonic or septicæmic plague. Table II gives the course of events in Bengal during the pandemic of plague, while table I gives similar details about the city of Calcutta.

gradually to other wards and within the course of three or four years practically each and every ward in the city was affected. In the later period, as mentioned before, when the infection began to clear, the wards affected late were the first to become free from infection. The wards that reported cases till the end were the wards first infected or those in their immediate neighbourhood.

Do like causes operate in the progress and decline of pandemics of plague in the world as in Calcutta ? If so, a detailed study of happenings in a comparatively small unit like Calcutta city should be of great importance from the

TABLE II

Showing plague mortality in the different districts of Bengal during the last pandemic

District	1897	1898	1899	1900	1901–05 *	1906–10 *	1911–15 *	1916–20 *	1921–23 *	1924	1925	1926
Burdwan ..	..	..	..	20	20	20	16	..	..	1	..	..
Birbhum ..	..	..	..	..	1	..	1	5	1	..	..	..
Bankura ..	..	..	..	..	1	1	1	..	..	..	..	..
Midnapore ..	..	..	..	23	8	1	1	..	1	..	..	..
Hooghly ..	..	..	14	66	124	7	4	6	4	1	..	..
Howrah ..	..	..	111	198	404	62	40	4	2	..	..	..
24-Pargannas ..	..	..	79	71	117	22	40	35	1	..	..	..
Calcutta city ..	..	151	2,689	8,275	7,097	2,192	1,011	151	100	33	9	..
Nadia ..	..	..	..	..	7	18	1	1	..	..	..	..
Murshidabad ..	..	..	..	..	..	..	..	..	..	..	..	..
Jessore ..	..	..	..	..	1	1	..	..	..	..	..	..
Khulna ..	..	..	..	..	1	..	..	..	..	..	..	..
Rajshahi ..	..	..	..	..	..	..	..	..	1	..	..	..
Dinajpur ..	..	..	..	..	..	..	..	..	..	..	..	..
Jalpaiguri ..	..	..	..	..	..	..	..	..	..	..	..	..
Darjeeling ..	..	..	..	..	1	2	..	..	..	..	..	..
Rangpur ..	..	..	..	..	..	..	..	..	..	..	..	..
Bogra ..	..	..	..	..	..	..	..	..	..	..	..	..
Pabna ..	..	..	..	..	..	..	..	..	..	..	..	..
Malda ..	..	..	..	..	..	..	..	..	..	..	..	..
Dacca ..	..	..	65	..	2	..	..	..	7	..	..	..
Mymensingh ..	..	..	..	..	1	..	..	1	..	..	..	..
Faridpur ..	..	..	30	..	..	..	..	2	..	..	..	..
Bakergunj ..	..	..	..	..	..	..	..	4	..	..	..	..
Tippera ..	..	..	..	..	..	..	..	..	..	..	..	..
Noakhali ..	..	..	..	..	..	..	..	..	..	..	..	..
Chittagong ..	..	..	..	..	..	..	..	..	..	..	..	..

* The yearly averages for these periods are given.

It will be seen that the brunt of infection was borne by Calcutta city and the districts in its neighbourhood. The general phenomena of expansion and retraction observed in plague epidemics throughout the world was also a noticeable feature here. Epidemics first started in Calcutta and then began to spread to the outlying districts, the severity of epidemics being in inverse proportion generally to the distance of the districts from Calcutta. Again the outlying districts became free from infection earlier, and towards the close of the period (1923-24) we see that it was Calcutta alone that was still reporting deaths from plague.

The same phenomena observed on a miniature scale in the events occurring in the city of Calcutta itself. The disease first started and was severe in wards V, VI and VII where the conditions for the spread of infection were very favourable. It then began to spread

point of view of the elucidation of this universal phenomenon.

The search for the explanation of the phenomena of succession of epidemics has engaged the attention of the epidemiologists from the dawn of scientific medicine, but we seem to be nowhere nearer the goal than was Hippocrates or Galen. Various theories have been put forward from time to time. Hippocrates first observed the sudden and almost simultaneous epidemics over large areas and was probably also aware of their recurrence at longer or shorter intervals. He sought for the explanation of these variations of the epidemics in the changes in the atmosphere, and his opinions were later summed up in the phrase 'Epidemic constitution of the atmosphere'. This doctrine was revived later by Ballonius. It was Sydenham that further expanded this theory and gave it a touch of mystery, and said that the variations in the

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epidemics were due to some invisible changes in the bowels of the earth. He tried to prove, by collecting statistics regarding the epidemics in the past, that there are gradations, modifications and affinities among epidemics occurring in successive cycles of years, and that in certain conditions such epidemics must be considered as a whole and not separately.

Mere statistical evidence alone cannot be of much value unless some laboratory evidence also is forthcoming. The modern revivalists of Sydenham's epidemic constitution theory, in a modified sense, seek explanation of secular periodicity in the facts such as the eleven-year sun-spot cycle, which profoundly influences the climatic factors and with which the spread of the disease transmitted by insects is closely associated.

Last in the field in this respect is Gill (1928) who comes forward with the 'quantum theory' which tries to explain that epidemics are generally caused by a loss of balance between the quantum of infection and immunity factors. Whatever the merits of this quantum theory may be as an explanation of the short-term variation in the plague incidence it affords no satisfactory explanation of the long-term periodicity of plague, as immunity to plague both in human beings and rodents, acquired either by natural infection or produced artificially, does not seem to last for a long time or much less to be transmitted to succeeding generations.

To get an insight into the mechanism of long-term periodicity of plague is not only of academic interest, but also might possibly lead us to the discovery of certain factors which could be controlled by human efforts and thus save the community from the periodic visitation of these disastrous epidemics.

The following remarks of Colonel Sokhey (1937) in this connection bear quotation :—

'It is a comparatively quiescent period after a severe pandemic with just a few cases of plague here and there. These factors make the present period an ideal one for further study and any expenditure that may be incurred would be well worth it. If this period once passes without our acquiring all the knowledge we need to understand the phenomenon fully and thereby devising intelligent means of preventing fresh pandemics[*sic*]. Unless deliberately prevented, pandemics are likely to come again as they have come in the past'.

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(Continued at foot of next column)

SOME OBSERVATIONS OF PRACTICAL IMPORTANCE AND INTEREST FOR THE MALARIOLOGIST

By M. M. SYDDIQ, M.B., B.S., L.R.C.P., M.R.C.S. (Eng.), D.O.M.S. (Lond.), D.P.H., D.T.M. & H. (Lond.)
Chief Malaria Officer, Hyderabad-Deccan

I. Paris green

PARIS GREEN as ordinarily used (1 or 2 per cent) is effective against anopheline larvæ, and culex larvæ only when breeding in clean waters like those of paddy fields. In sullage waters culex larvæ are much more vigorous and resistant, and surface sprinkling of Paris green has no effect whatever on them.

Our observations have led us to believe that the larvæ die by swallowing small particles of Paris green. It was suggested that if Paris green could be applied in such a way that it sank in water, where, after disintegration of the mass, particles gradually rose, the culex larvæ would consume these particles and perish. With this object in view balls containing Paris green were made. The balls are made up of finely sifted road dust to which two per cent of Paris green has been added. They are made up by gradually adding water to produce a suitable consistency for making up into balls. Each ball weighs about two ounces, that is to say, about 1,000 grains, and contains 10 grains of Paris green powder (*see* figure 1).

They dry and keep well when made up, and a number can be kept in stock. These balls

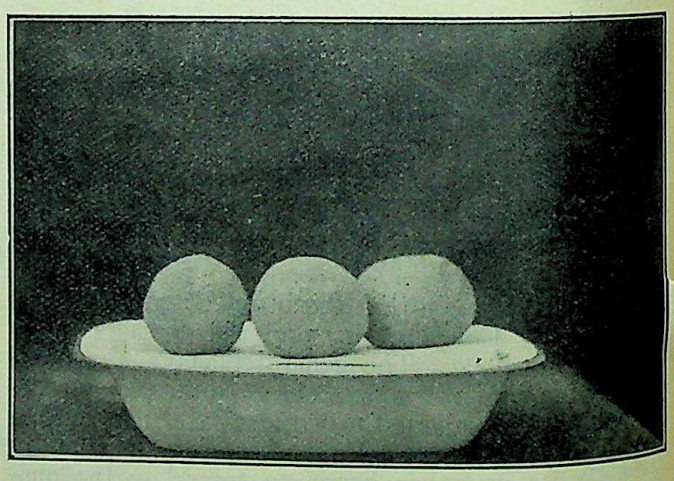

Fig. 1.

added to small collections of water are fatal to culex as well as anopheline larvæ. It is as well also to powder the surface in known anopheline breeding places.

(Continued from previous column)

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Two balls are sufficient for about 8 cubic feet of water.

The balls are not effective when the depth of water is greater than 5 feet; they are therefore unsuitable for wells.

It should be noted in this connection that 'Malariol' (Burmah-Shell Co.—mixture of kerosene, crude oil and cresol) used by this department is not 100 per cent effective against culex larvæ and pupæ in sullage waters; in such contaminated water the film is irregular. Even after very heavy application some larvæ and many pupæ persist after as long as three days.

Our observations on Paris-green balls have been confirmed by Doctor Dallal of Bombay.

II. Paris green and paddy fields

That one per cent Paris green applied once a week has no untoward effect on rice crops has been amply proved by our experience here. We have actually kneaded Paris green into mud growing very young plants. No bad effects were observed. But two per cent Paris green applied twice a week is absolutely destructive

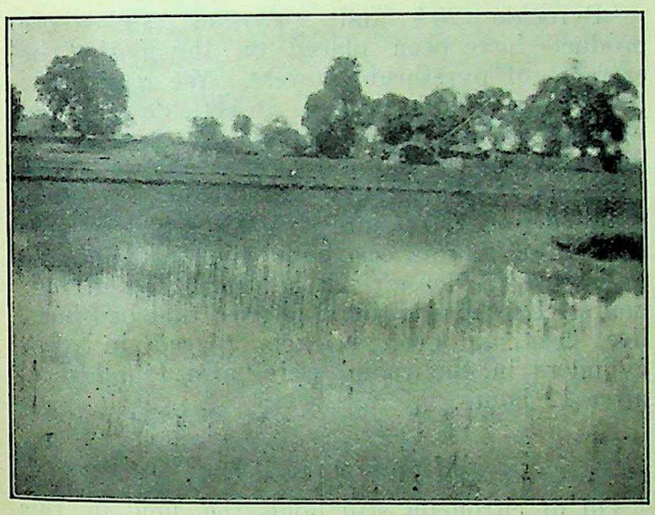

Fig. 2.—Showing crops destroyed by Paris green in the foreground, with a normal crop in the background.

to rice plants. The accompanying photograph amply upholds this statement (figure 2).

The question has been raised that even one per cent Paris green might adversely affect delicate flowering plants. Our experience in public and private gardens does not substantiate this view.

III. Larvæ in mud

It was observed that pits that had practically dried up and remained untreated after a rainfall overnight contained larvæ 5 to 6 days old. In this connection there is no question of a thin pellicle of water on the surface. These places look like ordinary moist earth. When such mud is taken and water poured over it larvæ revive after some minutes. During laboratory experiments they have never survived after more than 24 hours, but in the paddy fields after depletion of all water they were still alive after 72 hours. In this connection it must be remembered that farmers are apt to be very vague about time. Besides, the fields are not given perfect slopes to drain away all water after inlets are stopped and outlets opened. Some water remains standing and only gradually dries up.

In moist mud in pits where definite numbers of larvæ were placed and then were allowed to dry out, the following observations were made. From the nature of the experiments it is not possible to make absolutely exact statements, but every effort has been made to arrive at a good working hypothesis.

The type of the soil, the temperature and humidity will play an important rôle in this matter.

It will be seen that pupæ are more resistant than larvæ, and anopheline larvæ keep alive longer than culex larvæ. Moisture is sufficient to keep them alive for some time. Death eventually takes place, either through desiccation or starvation, as the mouth brushes cannot be utilized under these circumstances.

The question arises as to whether these larvæ under such circumstances are capable of carrying through their different developmental stages. Experiments have shown that the development of larvæ is considerably retarded when they are kept in mud and the pupa does not develop into the imago.

In his report on antimalarial measures in Java and Indo-China, Dr. C. F. Chenoy, Deputy

TABLE

Showing larvæ and pupæ alive when specimens were taken at definite hours after all free water had disappeared

	12 hours	24 hours	36 hours	48 hours
Larvæ, anopheline	30 per cent	12 per cent	2 per cent	Nil
Larvæ, culex	20 „	8 „	Nil	Nil
Pupæ, anopheline	40 „	15 „	5 per cent	Nil
Pupæ, culex	40 „	15 „	5 „	Nil

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Director of Public Health Department, H. E. H. the Nizam's Government, writes :—

The principle underlying the method of periodical drying out of rice fields is to observe its influence on larval fauna. Experiments were carried out in Java and the method advocated there is to flood the rice fields for nine continuous days and then dry out for two consecutive days. This was repeated as long as was necessary. I am told that the result of this experiment has been that 75 per cent of the larval fauna-breeding was completely controlled.

In this experiment, I am told that about 7 per cent of the yield of the crop of paddy was less and the Java Malaria Department are of opinion that probably this was mere coincidence but will have to be carefully controlled before such measures are widely applied.

In Indo-China, Government have taken up this method on a larger scale and the method applied is still more rigorous. The method is as follows:—

The fields are irrigated for three days and for the other three days water is stopped, the result being the fields are completely dry for full 24 hours out of the six days. In these rice fields, the Indo-China people say they have not been able to find a single larva.

Further they mention that the quantity of paddy is nearly equal or equal to that of the fully irrigated fields.

In the case of half-dried or dry pits the practice here, during the rainy weather, is to place lumps of road dust soaked with 'Malariol' in them. When the rain falls and the larvæ emerge, at the same time oil also spreads and destroys them.

The problem of dealing with larvæ in running water, often highly polluted, is extremely difficult. Pits and big wells which are in the process of being filled in by street refuse breed mosquitoes and are difficult to deal with. Here some larvicide is necessary which is instantaneous in its effect. With this object in view several chemicals were tried; some of them proved quite efficacious in the laboratory, but they have not been successful in the field.

The following were tried :—

(1) Copper sulphate.

(2) Potassium permanganate.

(3) Malariol with excess cresol.

(4) Formaldehyde gas—obtained by first applying bleaching powder and then 40 per cent formalin.

(5) Carbide.

(6) Calcid—gives off HCN when it comes in contact with water.

(7) Crude sulphuric acid, just acid to litmus.

(8) Sodium chloride.

(9) Larvetol—this is giving encouraging results but yet it is premature to make a statement.

In running waters in 'kutcha' drains we have found that if pieces of wood are placed across the drains at suitable distances according to the amount of breeding, these pieces of wood block the larvæ to a great extent and there is no impediment to the flow of water. If oil is applied to such drains, it also is retarded by these pieces of wood and remains in contact with larvæ long enough to kill them. The accompanying photograph explains the method (figure 3).

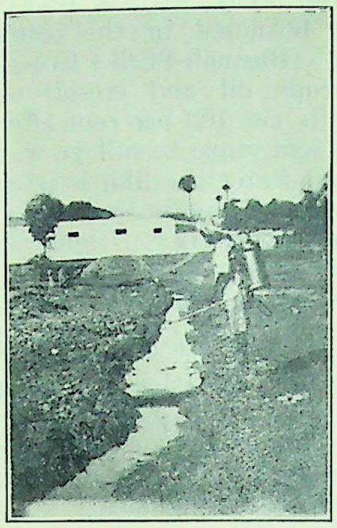

Fig. 3.—Showing a piece of wood placed across a drain.

'Pyrocide 20' and 'Pyretol 19'—these products have been placed on the market as extracts of pyrethrum flowers. We have tried them in a closed room as insecticides, diluted with kerosene oil 1 in 20 and 1 in 19. No direct aim at the mosquitoes is necessary. Half an ounce of the mixture was freely sprayed in a closed room (600 cubic feet) in which a large number of mosquitoes, both culex and anopheline, were let loose. All of them died in four hours. It is of additional interest that bed bugs, lice, fleas and even crickets placed in glass cylinders in the room were also found dead after 12 hours.

Mosquito repellents

Oil of citronella still holds the field in this direction but its effect can be made more lasting when it is combined with other substances in the form of a cream. The following is a good formula :—

Bees wax ..	.. 2 drachms.
Spermaceti ..	.. 4 „
Coco-nut oil ..	.. 4 „
Liquid paraffin	.. 1 ounce
Oleum citronella	.. 1 „
Acid carbolic ..	.. 10 minims
Fuller's earth ..	.. 4 drachms

The bees wax and spermaceti should first be melted in a water bath, the oil and other ingredients added after melting, except oil of citronella and acid carbolic which should be added just before resolidifying. It is a clean preparation, easy to apply, easy to carry about and the effects are more lasting.

(Continued at foot of opposite page)

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VARIATIONS IN THE PLATELET COUNT IN TYPHUS ASSOCIATED WITH HÆMATURIA

By R. L. HAVILAND MINCHIN, M.D.,
CAPTAIN, I.M.S.
Additional Professor of Medicine, Medical College, and Physician, General Hospital, Madras

THE case of typhus fever described here, though resembling in many ways the type that has been described as occurring in many parts of India, presents certain striking characteristics which make it worthy of record.

On 27th July, 1938, a Hindu male, aged 14, was admitted into the General Hospital wards under my care; he stated that he had not been out of Madras city for seven months, and up to nine days previously had been in perfect health.

Nine days before admittance he developed a low fever associated with headache and pain in the joints, but no rigor. At no time had the temperature exceeded 102°F.

The day before admittance, *i.e.*, on the eighth day of the fever, he developed petechial red spots all over the body; these spots did not vanish on pressure, were of a red-brown colour, and were more or less evenly distributed all over the body, on the face, soles of the feet, and palms of the hands. The doctor attending the case suspected the condition to be one of typhus and sent a specimen for blood agglutinization against *Bacillus proteus*. The same evening the urine was found to be bright red in colour.

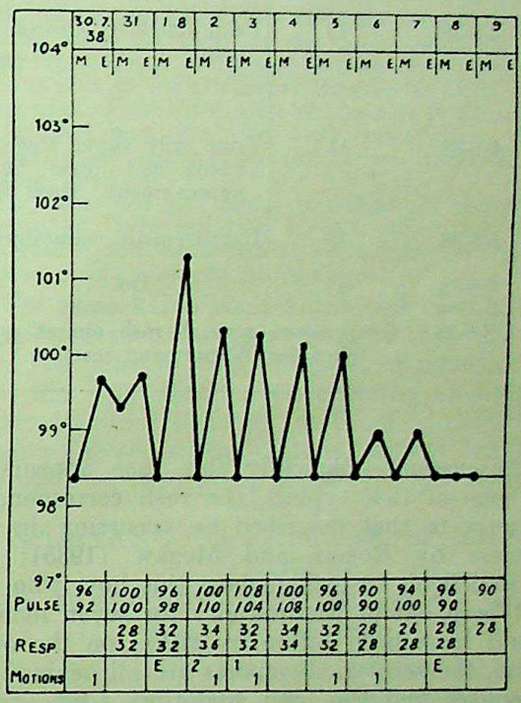
(*Continued from previous page*)

My thanks are due to the Director, Medical and Public Health Department, H. E. H. the Nizam's Government, for his permission to publish these notes and to Dr. C. F. Chenoy, Deputy Director of Public Health, H. E. H. the Nizam's Government, for his very useful suggestions. Also to my staff for assisting me to complete this work.

Summary

1. An effective method of applying Paris green to destroy culex larvæ in small pits containing sullage waters has been described.
2. Two per cent Paris green applied twice weekly is very harmful to rice crops.
3. A new observation about the capability of larvæ to survive in mud for some time has been made and the practical utility of this observation discussed in connection with paddy fields.
4. Difficulty of dealing with mosquito larvæ in running waters is mentioned and results of some larvicides tried to that effect are given. A method to deal with this difficulty is described.
5. Results of experiments on adult mosquitoes with Pyrocide 20 and Pyretol 19 are given.
6. A formula for a mosquito repellent is given.

The next day I was called to see the case as the boy was passing almost pure blood, and was showing definite signs of blood loss. I advised his transfer to hospital so that transfusion could be carried out if necessary. At this time, in addition to the rash and hæmaturia, subconjunctival hæmorrhages of both eyes had appeared and areas of hæmorrhage existed under the mucous membrane of the tongue and lips. On taking the blood pressure, however, no new areas of hæmorrhage appeared. Examination of the heart at this stage showed no enlargement, but the presence of a systolic murmur in the mitral area. Telephone report from the bacteriological laboratory gave agglutinization of blood up to 1 in 200 against *B. proteus* X19(O).



On the following day, in spite of the bacteriological report, the possibility of the condition being due to purpura hæmorrhagica was considered and a complete blood examination was carried out, the results being—

Red blood corpuscles		3.10 million per c.mm.
Hæmoglobin	..	60 per cent.
White blood corpuscles		8,750 per c.mm.
Polymorphonuclears		75 per cent.
Lymphocytes	..	19 „
Monocytes	..	5.5 „
Eosinophiles	..	0.5 „
Thrombocytes	..	25,000 per c.mm.

The urine continued to consist of almost pure blood, so the boy's and his parents' blood were typed and found compatible. The parents were told to keep in touch with the hospital so that transfusion could be done if necessary. In the meanwhile the patient was given an alkaline mixture and large volumes of fluid to drink to keep the renal tract free from blood clots.

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The progress in this case will be seen from the temperature chart in the previous column and the tabular statement below :—

Date	Day of disease	Symptoms	Blood and laboratory reports
1-8-38	11	Hæmaturia still marked, no new spots.	Thrombocytes—28,000 per c.mm. Blood culture—sterile. Weil-Felix X19(O)—1 in 200. *Bact. typhosus*, para A and B all negative. Urine culture—negative.
2-8-38	12	Unchanged.	Thrombocytes—29,000 per c.mm. Leucocytes—9,060 per c.mm. Erythrocytes—2.4 million per c.mm. Hæmoglobin—49 per cent.
3-8-38	13	Urine slightly clearer, clinical improvement.	Thrombocytes—29,000 per c.mm. Leucocytes—9,060 per c.mm. Weil-Felix X19(O)—1 in 3,200. X2(O) negative; XK(O)—1 in 50.
4-8-38	14	Urine only shows trace of blood. Transfusion not done because of clinical improvement. Rash fading.	Erythrocytes—1.94 million per c.mm. Thrombocytes—30,000 per c.mm.
5-8-38	15	Improvement maintained.	Thrombocytes—38,000 per c.mm.
6-8-38	16	Do.	Thrombocytes—54,000 per c.mm.
8-8-38	Temperature normal—rash almost gone. Patient wishes to leave hospital. Left on 9th; blood taken for Wassermann reaction. Report positive.		

Discussion.—Clinically this case appears to be one of tick typhus, the rash corresponding exactly to that described as occurring in this disease by Rogers and Megaw (1935); but it is difficult to explain how this boy, who had not been out of Madras city for seven months, could have been bitten by ticks; on the other hand, the serological reports are all against this diagnosis and the high agglutinin titre against *B. proteus* X19(O) suggests that the condition was one of louse or flea typhus, and the environment of this patient is also more in favour of this hypothesis.

It is unfortunate but not surprising that *B. proteus* could not be recovered from the urine of this case, but this has never been done in India. Incidentally, injection of the blood obtained at the height of the disease into rats failed to produce signs of disease.

The symptom of profuse and dangerous hæmaturia which was so prominent in the patient does not appear to have been previously described as a complication of tick typhus though Mulvany (1935) described a similar case which he considered was enteric, but which well might have been typhus.

The appearance of the rash might possibly have been confused with syphilis and in favour of the diagnosis is the positive Wassermann reaction at the end of the fever. This, however, appears to be an almost constant finding at the end of attacks of typhus.

The low platelet count at the height of the disease is of importance, as this without the report on the Weil-Felix reaction might have given rise to a diagnosis of purpura hæmorrhagica. This count is of interest as it does not appear to have been made previously and in the case here described clinical improvement corresponded with and was preceded by a rise in the number of blood platelets*.

Summary.—An unusual case of typhus is described where profuse hæmaturia is the main symptom. The differential diagnosis is discussed and the rise in platelet count with clinical improvement is noted.

I am grateful to Dr. G. S. Viswanathan, Clinical Pathologist to the Madras General Hospital, for hæmatological reports and Lieut.-Col. M. M. Cruickshank, I.M.S., Superintendent, for permission to publish this report.

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*The first clinical improvement was noted on the 3rd August, but on the 4th August the platelet count had only improved by 5,000, which, in view of the large technical error in platelet counting, is an entirely negligible figure. It cannot therefore be said that the rise in the platelet count preceded the clinical improvement.—Editor, *I. M. G.*

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A Mirror of Hospital Practice

A CASE OF TAPE-WORM SIMULATING ACUTE APPENDICITIS

By D. A. GANGOLLI, L.C.P.S.
Medical Officer in charge, Dispensary, Bhayndar (District Thana)

A. B., a strong and well-built man, aged about 30 years, complained of severe pain in the abdomen with high fever. The patient had gone to bed apparently normal the previous night, and the pain and fever had set in suddenly since the morning. The pain was generalized all over the abdomen and was more marked in the right iliac fossa. On examination the whole abdomen was found rigid and board-like with definite and marked tenderness in the right iliac fossa more or less at the McBurney's spot, where a small lumpy mass about the size of a small orange was felt. The patient was lying on his back with the right leg drawn up to relax the abdominal muscles. His face was anxious and drawn, with the lips and tongue dry. Temperature was 104°F. and pulse 136 per minute. He had vomited twice since the morning and the vomiting was preceded by nausea. He had also passed a stool since morning which on inspection appeared to be more or less normal. A blood slide was examined, but neither malarial parasites nor definite leucocytosis could be found. The case appeared to be one of acute appendicitis. But the sudden high rise in temperature to 104°F. led to a doubt about the diagnosis as experience has shown that an initial temperature higher than 102.5°F. is against appendicitis. As smallpox cases had been reported to be occurring round about the district, and as acute abdominal pain with vomiting is not uncommon at the onset of acute infective fevers, the patient was kept under observation. He was given a simple diaphoretic mixture, and hot fomentations were applied to the abdomen.

Next morning the patient was practically in the same condition. Temperature was 103°F. and pulse 124 per minute. He passed one stool, in the morning after a severe colicky sensation, which contained a small gelatinous piece resembling the segment of a tape-worm. In spite of his seemingly acute condition he was given 30 minims of carbon tetrachloride in one ounce of saline (containing two drachms of magnesium sulphate) and four hours later he passed a stool consisting more or less entirely of a tape-worm, the mass being as big as a tennis ball. With this the patient felt very much relieved, the pain in the abdomen lessened and the lumpy mass in the right iliac fossa disappeared. The diaphoretic mixture was continued for the day, and an intramuscular injection of quinine 6 grs. was given.

From the third day onwards the pain and tenderness in the abdomen gradually disappeared, temperature and pulse came down to normal and the further recovery of the patient was quite uneventful.

Discussion

In this case the lumpy mass in the right iliac fossa was undoubtedly caused by the distension of the cæcum due to the presence of an enormously long tape-worm within it, and the bulging disappeared simultaneously with the ejection of the worm. The pain and tenderness in the right iliac fossa were due to typhlitis with erosion of the mucous membrane of the cæcum. Probably there was concurrent appendicitis as well in a mild form due to obstruction of the appendicular opening leading to stagnation of its contents. When the worm was expelled, naturally the obstruction in the appendicular opening was also relieved. The concomitant high fever in this case is difficult to explain. On a suspicion of co-existing malaria, as it is endemic here, the administration of a quinine injection was felt necessary.

AN AMBULATORY CASE OF FRACTURE OF THE LUMBAR VERTEBRÆ

By B. L. CHOPRA, L.R.C.P., L.R.C.S., L.M., D.P.H., D.T.M. (L'pool)
Divisional Medical Officer, North-Western Railway, Karachi

A GANG-MAN, while working on the open line, was knocked down by a shunting engine and fell on his back. Soon after he was seen by a doctor and kept in bed for about 10 days after which time the employee wanted to go back to duty. His request was acceded to and he continued his work for about six months.

During this period he used to complain of pain in his back, off and on. Thereafter the pain became constant and he could not carry on his duties efficiently and again reported sick at Panipat Railway Hospital whence he was sent to the Divisional Hospital at Delhi where I saw him. I suspected some old fracture in the lumbar region and sent him for *x*-ray examination which revealed two fractures in the bodies (2nd and 5th lumbar vertebræ).

The man was kept under treatment for about four months at Delhi and then given a supporting spinal leather-belt and discharged fit for a light job which I believe he is performing up till now.

The remarkable point about this case is that in spite of such a serious injury to the spine the man continued to work for about six months, and it is this point that makes it worthy of record.

My thanks are due to the Chief Medical and Health Officer, North-Western Railway, Lahore, for his kind permission to publish this case.

SPONTANEOUS RUPTURE OF THE HEART

By MOHD. MOHSIN ALI ABBASI, M.B., B.S.
Ripon Hospital, Simla

THE dead body of a male, sweeper by caste, aged about 48 years, an hotel employee in Simla, was brought for post-mortem examination on 4th April, with the report that the deceased had complained of stomach pain at 9 a.m. on the previous day. He drank some tea at noon and had kept up until about 6 p.m. when he took to bed and expired at 10-30 p.m.

Previous history.—Nothing elicited except that he had previously suffered similar attacks of pain from time to time.

General physical examination.—He was a well-built man, 5 feet 2 inches in height, aged about 48 years, with grey hairs. No mark of any injury was discerned on his body, nor was there any history of trauma.

Post-mortem examination.—Abdominal section revealed nothing as to the cause of death. There was a small subperitoneal ecchymosis over the right side of the inferior vena cava close to the root of the transverse meso-colon; and small groups of ecchymoses were present on several appendices epiploicæ of the pelvic colon.

On opening the thorax there was found some ecchymoses in the fatty tissue overlying the pericardium. The pericardial sac contained about 8 ounces of fluid and clotted blood. The heart was soft and flabby. The left ventricle was thin-walled and its front surface presented an area about one and a half inches in

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diameter within which were several lacerations situated half-way between the root of the aorta and apex of the heart and just to the left of the interventricular septum. Two of these lacerations penetrated into the cavity of the ventricle; the others were superficial. The affected area of the ventricle was outlined by adherent blood clots, both on the epicardial and endocardial surfaces. The lining membrane of the root of the aorta showed numerous yellow atheromatous patches.

This case is reported as one of spontaneous rupture of the heart without any evidence of causal exceptional effort or strain.

The heart muscle showed evidence of degeneration attributable to coronary disease. The condition is rare. Goodall and Weir (1927) have recorded 18 cases of spontaneous rupture of the heart muscle.

My thanks are due to Lieut.-Colonel A. Sargood Fry, I.M.S., Civil Surgeon, Simla East, who conducted this post-mortem examination and has permitted me to send these notes for publication.

REFERENCE

Goodall, J. S., and Weir, H. B. (1927). *Brit. Med. Journ.*, Vol. I, p. 834.

HOMICIDE BY A PATIENT APPARENTLY SUFFERING FROM CEREBRAL MALARIA

By GEO. P. FRANCIS, L.M.P.
Sub-Assistant Surgeon, Jail Hospital, Moulmein, Burma

A KAREN FEMALE, aged 26, was admitted to the District Jail, Moulmein, as an undertrial prisoner with the following history:—

She was married about three years ago and lived happily. A daughter was born to her about a year ago, since then she had been having repeated attacks of malaria. She was under the treatment of a Burmese *Se Saya* (physician) of her village. On the night of the 2nd February, 1938, she retired to bed with her husband with nothing unusual in her demeanour. At about 4 a.m. the next morning, the neighbours hearing strange noises emanating from their bedroom, broke open the mat-wall partition and found the husband lying hacked to death with several cut wounds and the wife lying prostrate over his body with a *dah* in her hand. The headman of the village who was also present seized the *dah* and placed her under arrest when she stated that her family *nat* (spirit) had persuaded her to do the murder.

She was suffering from fever for about a month, and the *Se Saya* saw her last about four days before the incident. After arrest she was treated at an outlying civil hospital from the 3rd to the 6th February, 1938.

6th February, 1938. On admission to the Moulmein Jail, she was very weak and unable to walk. She refused to take nourishment. She had a temperature of 99°F., with pulse 90 and respiration 24. She was restless, looked very much depressed and was not able to answer questions. At times she was very violent and tried to bite other prisoners near her and wanted to commit suicide. She looked dazed and had no idea of her surroundings. She was reported as having fits frequently. Her tongue was furred and coated, bowels constipated, and spleen palpable. No other abnormalities were detected. She was given a dose of saline mixture and put on bromides.

7th February, 1938. Temperature 99.2°F., pulse 88, respiration 24. She was restless and kept on staring at people. Slept off and on. Mental condition same.

8th February, 1938. Temperature 99.4°F., pulse 92, respiration 24. Blood examined for malarial parasites, result negative. An injection of quinine dihydrochloride was given in the morning. Her mental condition improved marvellously. She was later able to take her nourishment well, behaved well, slept well and could talk sensibly.

9th February, 1938. Temperature normal. An injection of quinine was repeated. Her mental condition improved to such an extent that from this day onwards she was normal and worked with other prisoners voluntarily.

She made uneventful progress and was able to stand her trial in court, where she was surprised to hear that her husband was murdered and that she was accused of the crime. She became hysterical on hearing this news.

In the medical evidence it was deposed that she was suffering from cerebral malaria on admission to the Moulmein Jail, that it was possible she might have been suffering from this complaint for several days or more, that her sanity would be affected and that probably she would not know the nature of the act, whether it was wrong or contrary to law. The other evidence recorded was found to support the view that the accused committed the offence while she was suffering from cerebral malaria.

The court accepted the evidence, and she was directed to be discharged.

In conclusion, I express my gratefulness to Major T. J. Davidson, I.M.S., Medical Officer and Superintendent, District Jail, Moulmein, under whose supervision the case was treated, for his many valuable suggestions and kind permission to make use of the records available in publishing this case.

A CASE OF SPONTANEOUS HÆMATOMYELIA

By S. AHMAD, F.R.C.S.
CAPTAIN, I.M.S.
Civil Surgeon, Sitapur
and
RANBIR SINGH, M.B., B.S., P.M.S.
Medical Officer in charge, Sadar Hospital, Sitapur

A MOHAMMEDAN male, aged 30 years, was admitted into the Sadar Hospital, Sitapur, on the 20th May, 1938, at 8 a.m., complaining of retention of urine and fæces.

The history was that at 8 p.m. on the previous evening he took a cold bath, changed his clothes and sat down. He felt sick and vomited three times. Next he wished to get up to pass urine but was unable to do so. He was brought to the hospital at midnight and taken back home after he had his urine drawn. He refused to be admitted on this occasion.

He gave a history of syphilis about a year back.

Condition on admission.—There was complete flaccid paralysis and loss of sensation below the lumbar region with retention of urine, the bladder being distended up to the umbilicus. Except the complete loss of tendon jerks in the lower extremities, the central nervous system showed no other abnormality. The patient complained of no pain and was generally comfortable except for the retention noted above. Temperature—100°F.; heart, lungs, etc., normal.

His urine was drawn regularly and the condition closely watched. In view of the history of syphilis potassium iodide and mercury were given by mouth. On the 22nd, his temperature rose to 103°F., power of speech was suddenly lost, breathing became stertorous, and he became unconscious. The coma deepened and he died at night.

Comments.—A case of spontaneous hæmatomyelia, diagnosed clinically, is described. It appeared to spread from below upwards.

It is of interest that there was no history of injury direct or indirect precipitating the disease.

Girdle pain which is described as usually present in such a condition was absent in this case.

Lumbar puncture could not be done because of the unwillingness of the patient.

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Indian Medical Gazette

NOVEMBER

PROFESSION OF PHARMACY IN INDIA

PHARMACY, in the sense in which the term is used in western countries, is practically non-existent in India; for this reason few medical men in this country realize the important part that the pharmacist plays in the practice of scientific medicine and as a unit in an efficient health service in any country. The pharmacist is the custodian of the drugs that are such an essential part of our equipment. He prepares, compounds, and dispenses drugs, and on his expert knowledge and efficiency will depend to a large extent the purity and potency of the preparations used by the doctor. The physician of to-day, whose time is fully occupied in diagnosing his cases and prescribing treatment, has no time left to dispense his own medicines, as he used to do in the past; the wider scope of medicine as a science also makes it impossible for him to devote time systematically to the study of pharmacy. In the matter of drugs, their dispensing and preparation, therefore, the physician will have to depend more and more on the advice and guidance of the pharmacist. Further, the physician in western countries is beginning to turn to the pharmacist for information in connection with new preparations and drugs. This means that pharmacists have constantly to keep themselves abreast of current medical knowledge, in so far as it deals with drugs, so as to be in a position to discuss intelligently such matters with the physician. The relation of pharmacy to the practice of medicine in everyday life is therefore intimate and the pharmacist forms an integral part of the health service of which the practitioner is the central figure.

Compared with their status in Great Britain, on the Continent of Europe, in the United States of America, and in nearly all other civilized countries all over the world, the status of the pharmacist in India is a most deplorable one. The profession of pharmacy in India is represented by a class of people known as 'compounders', whose status and functions are ill defined and duties multifarious. They compound and dispense medicines, including the most potent preparations and deadly poisons, in many cases in complete ignorance of their properties and potency. In many mofussil hospitals and dispensaries they also work as dressers, as laboratory and hospital assistants, and as male nurses; they give anæsthetics and assist at operations; they carry on the duties of the medical officer when he is temporarily away, and usually pass as a 'doctor' before the lay public. In fact, 'compounders' in India form a very heterogeneous group of people who indulge in every conceivable form of medical activity outside their legitimate duty of compounding, dispensing and supplying medicines according to the prescription of the physician.

The evidence produced before the Drugs Enquiry Committee, appointed by the Government of India in 1930-1931, regarding the character and quality of work turned out by compounders as a whole, in this country, was far from being complimentary. The public and medical men from all over India expressed dissatisfaction with their work. Charges of ignorance, carelessness, lack of responsibility, and dishonesty were levelled at them. There seems little doubt that many of them ply a profitable trade in all kinds of spurious and faked products.

This is a very unsatisfactory state of affairs and unless something is done to improve the status of the pharmacist and limit the practice of pharmacy to a properly qualified group of people, the advance of medical practice in India and of the health service of the country is bound to be retarded.

At present, the practice of pharmacy in India is subject to no laws or restrictions whatsoever. The titles of 'chemist' and 'druggist' have no significance, as they are freely used by anybody who may choose to adopt them. There is nothing to prevent the most ignorant person from opening a chemist's shop and dispensing the deadliest poisons, whilst the qualified chemist next door is in no way protected against unscrupulous competition.

The present state of affairs can best be described, not so much as a vicious circle but as a morbid stasis. There are few opportunities for obtaining a pharmaceutical education, so that there are few qualified pharmacists; this means that unqualified pharmacists come into the field. As the latter can practise with no legal disabilities, and as he has no background of a, comparatively speaking, expensive education and training, and no professional pride or status to lose, the qualified pharmacist is from the commencement economically handicapped when he comes into competition with numerous, often unscrupulous, unqualified rivals. He has to sink to the level and practices of his rivals, or go under. In these circumstances it is not surprising that there is no great rush of candidates for pharmaceutical qualifications, and no incentive to anyone to extend the facilities for such training.

There is another aspect of this problem. While the profession of pharmacy is in this entirely uncontrolled and unsatisfactory state, it will be almost impossible to implement any legislation aimed at the control of the manufacture and sale of drugs and at the limitation of the practice of drug adulteration and of the trade in spurious drugs that is at present widespread in India.

Pharmacy is a noble profession and has been recognized as such in all the more advanced western countries. There is no reason why the

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practice of pharmacy in India should not be brought up to the same high level. The two most important requirements at the present moment appear to us to be, firstly, an improvement of the educational qualifications of those who take up the profession, and, secondly, the enactment of legislation preventing the practice of the profession by unqualified persons.

Pharmacy is an essential public service, and has proved its value beyond dispute. Without an efficient pharmaceutical service, scientific medical practice and honest drug trade and industry cannot prosper. The drug control movement which has been initiated by the Government of India is now making headway and the present seems to be a most suitable time for building up a profession of pharmacy in India with the same educational background and actuated by the same high ideals as exist in other countries. The present situation may be a serious one, but it is not one that cannot be remedied by efficient co-operation of the State and the profession.

Below we are publishing the presidential address of Colonel Chopra delivered before the Third Annual Conference of the Bengal Pharmaceutical Association. In this address, Colonel Chopra has laid stress on the close relationship of the profession of pharmacy with the other health services in India, and he considers the time most opportune for the enactment of legislation on the lines indicated above, which are broadly speaking those suggested by the Drugs Enquiry Committee of which Colonel Chopra was chairman. As no legislation of this kind should be undertaken by government without the advice and co-operation of those mainly concerned (in this case the pharmaceutical profession), the formation of representative bodies such as the Bengal Pharmaceutical Association is a welcome sign that the profession itself is fully alive to its shortcomings and its needs. It is now the duty of the central and provincial governments to take advantage of this new spirit and to assist them in every way by the introduction of legislation and the extension of training facilities.

ERRATA

In the last issue, in the article LATENT SYPHILIS IN THE TROPICS, by Major S. D. S. Greval and others, the following errors need rectification:—

page 588, column 2, para 3, lines 5 and 6:
for 'not gratification of sexual desires, illicitly', *read* 'not gratification of illicit sexual desires'.

page 590, column 1, II, 2:
for 'with a M.H.D.', *read* 'with 3 M.H.D.'

same page, column II, 7:
for 'not left for further detections and tests', *read* 'not left for further dilutions and tests'.

Medical News

BENGAL PHARMACEUTICAL ASSOCIATION THIRD ANNUAL CONFERENCE. PRESIDENTIAL ADDRESS, 1938

I. Profession of pharmacy and drug control

Gentlemen,

I consider it a great honour and a privilege to be here this afternoon to preside over the deliberations of the Third Annual Conference of the Bengal Pharmaceutical Association. Your representatives have once again prevailed upon me to accept the Chairmanship of your Association for the second time in succession. I had fervently hoped that the mantle of this office had fallen on some one with more leisure than I have, and who could more actively associate himself in all matters connected with the furtherance of the aims and objects of this association. Your assurance, however, that this can be achieved by my remaining President for another term, and my deep interest in the profession of pharmacy in India, in its organization, growth and prosperity has persuaded me to accept this signal honour with all the responsibility attached to it. I can assure you that, so far as it lies within my power, I will, with your co-operation and help, do my best to further the interests of this association, which is perhaps the most representative body of the profession of pharmacy in this country.

Pharmacy and public health

I will start by saying that the profession of pharmacy is an integral part of the noble profession of medicine and in almost all progressive countries in the world it is an important link in the chain of educational programme designed for public service, public welfare and public untility. In these days there are unquestionable signs of national awakening in every department of life in this country, and which department could be of greater importance for sound nation building than the one concerned with public health? No wonder then that in every province of India ways and means are being devised which will improve the health of the people and provide them with better facilities for prevention and cure of disease. One of the important factors which will contribute largely towards the attainment of this object is an efficient medical and public health service, of which the profession of pharmacy and control of food and drugs form an integral part.

Pharmacy in India and the work of the association

Training of pharmacists.—It is a matter of great concern to me that the profession of pharmacy in India is even now not properly organized, and, unless an association such as this makes a genuine effort to devise ways and means to improve the existing state of affairs, there is danger of matters drifting from bad to worse. In an address to this association on a former occasion not long ago, I dwelt on the deplorable state of pharmacy in this country and how this state of affairs could be remedied. I need not therefore dilate on it again. It will suffice here to state that the training of the pharmacists in India is most unsatisfactory and is not commensurate with the duties and responsibilities attached to their calling. Pharmacy is a definitely neglected profession in this country and the advantages accruing from the promotion of pharmaceutical education have not been sufficiently appreciated. If the present needs of the country in the matter of an efficient public health service are to be adequately met and if the tremendous undeveloped drug resources of the country are to be utilized, it is essential that the training of the pharmacists should be improved. Secondly, it is important that a correct conception of the nature of the profession and its functions and importance should be appreciated by the public. For this purpose an active educational propaganda has to be carried out.

It is a matter of great satisfaction to note that this association, during the last two years of its existence, has done very useful work in both these directions. Fully appreciating the fact that improvement in the

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standard of basic education and professional training is essential, this association made representations to the State Medical Faculty of Bengal to revise the present curriculum of the so-called compounder's course and bring it more in line with the recommendations made by the Drugs Enquiry Committee. In response to this, a committee was appointed by the Faculty under my chairmanship and I am glad to be able to say that this improved curriculum as originally drafted by the association has been generally accepted by the State Medical Faculty of Bengal and is now awaiting final sanction of the Government. I have every reason to hope that this will be approved. When this new and improved curriculum comes into force, I feel sure that a sound foundation will be laid on which the structure of the profession of pharmacy in India will rapidly rise.

Educational propaganda.—With regard to work of educational propaganda, the association has also achieved signal success. From the very inception of the Bengal Pharmaceutical Association, it was our intention that it should have a journal of its own; financial considerations however stand in the way of attainment of this object. Early this year Mr. Mundy, the managing editor of the *Indian and Eastern Chemist,* very kindly agreed to allow this well-known journal to act as the official organ of our association and through its columns it has been possible to carry out an educational propaganda among the pharmacists as well as among the public.

Widened scope of the association

Another important achievement of the association during the last year was the widening of the scope of its activities and inclusion in its fold not only of the pharmacists but all those interested in drugs, their manufacture, storage, handling and distribution. The pharmacists, pharmaceutical chemists, pharmacologists and dealers in drugs are all united under its ægis and all can profitably join hands in developing an ethical drug trade and thereby serving the community. This widening of the scope and activities of the association is a move in the right direction and promises immense possibilities in future. This association is now in a position to formulate ways and means for the improvement of the drug trade and industry on healthier and more ethical lines. It is gratifying to note that a number of firms and individuals representing the drug trade and industry have already joined the association. It is hoped that committees will be formed within the association to chalk out the programme of work in various branches with a view to eliminating, as far as possible, factors which have up till now hindered progress.

II. Control of drugs

The control of drug adulteration is, as you will all agree, an essential part of any public health campaign. Let us for a moment visualize the state of affairs existing in India at the present time with regard to drugs. From all the evidence that is available, both published and unpublished, there is hardly any room for doubt that the market in India is flooded with drugs and chemicals of defective strength and inferior quality. A large number of the most useful and important medicinal drugs on the market in India are often grossly and systematically adulterated to an extent difficult to imagine or believe in a civilized country. In order to satisfy the demand for 'cheap' remedies that would fall within the limited means of the people in general, substitution of genuine medicinal products by rubbish has been resorted to by a number of manufacturers, both indigenous and foreign. Potent remedies such as sera and vaccines, antigens, organic, arsenic and antimony compounds are being freely sold without their quality having ever been tested. The position emphatically is a source of very great danger to the public. Adulteration in other spheres might lead to a mere financial loss, but in the case of medicinal drugs it takes a heavy toll of human life.

I might mention in this connection the enormous growth of trade in quack remedies that has occurred in India during the last two decades. It is well known that there is at present no law in this country to prevent anyone from compounding any mixture he chooses to make, active or inactive, and selling it as a cure for any disease, backed by testimonials written by himself or by unknown physicians, provided he avoids the drugs scheduled under the Dangerous Drugs Regulations. Anyone can prepare and sell new drugs, without proper preliminary tests, using, as Lord Horder recently described it, the public as his 'guinea-pig'. Deliberately misleading labels and descriptions can be attached to any fancy product without any risk of prosecution for fraud. To add to all these, false and misleading advertisements extolling the virtues of preparations which do not exist and making highly exaggerated claims are daily encountered. In fact, all sorts of trickery and fraud are rampant in the drug market in India. The harmful effects of such nefarious practices to the public are too well known to the practitioner, but I am afraid are not sufficiently appreciated by the public in general. The enormous damage done to the health of the people by such traffic in spurious drugs can be readily appreciated even on a cursory examination.

The remedy

But what can be done to put an end to such a deplorable state of affairs? It must be said to the credit of the medical and pharmaceutical professions that they have been fully alive to the seriousness of the situation which has arisen and have made creditable attempts to put an end to it. It will be recalled that as a result of insistent demand from all quarters, the Government of India in 1930 appointed an *ad hoc* committee—the Drugs Enquiry Committee.

Of this committee, I was appointed the chairman and this gave me the opportunity of carefully investigating the whole question of drug adulteration and spurious drug trade from every point of view. I realized from the very beginning that organization of the profession of pharmacy on proper lines was an essential prerequisite of any scheme for the control and restriction of adulterated and spurious drugs in the Indian market. In the report of the Drugs Enquiry Committee you will find a scheme for putting the profession of pharmacy in this country on a solid foundation. The pharmacists are the persons who directly deal with the drugs. They are, in fact, the custodians of drugs; they are the people who prepare and compound medicinal preparations and on their efficiency depends the purity and effectiveness of the medicaments. If there is no healthy and effective co-operation from this class, no satisfactory solution of the problem of drug adulteration will be found.

Legislation to control drugs and pharmacy

With this idea in view, the Drugs Enquiry Committee suggested the enactment of legislation to control both drugs and pharmacy, either by a combined Drugs and Pharmacy Act, or by a Drugs Act and a Pharmacy Act separately as may be found convenient. If a separate Drugs Act and a separate Pharmacy Act are enacted, these should be passed simultaneously and should operate concurrently. The committee also recommended that the legislation should be *central* embracing the whole of India in its scope. Further progress has, however, been slow since April 1931 when the report of the Drugs Enquiry Committee was submitted to the Government of India, owing no doubt to the very complicated nature of the task. It was therefore a matter of genuine satisfaction to everybody concerned when the Central Government, as a first step in the direction of the much needed drug control, established the nucleus of a Central Drugs Control Laboratory—the Biochemical Standardization Laboratory—at the All-India Institute of Hygiene and Public Health in 1937. Such a laboratory is, of course, essential in order to evolve definite 'norms' or standards for conditions existing in this country, in order of medicinal preparations in the market. This laboratory has now functioned for about a year and a half and has accumulated a large amount of data regarding the

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quality of the drugs in use in this country by making a systematic analysis of medicinal preparations from all parts of India, both those manufactured in the country and those imported. Standards are also being worked out suitable for the climatic conditions prevailing here, but the legislation that can enforce such standards has to be enacted before this unit can be of any practical use.

Import of drugs bill

An imperfect piece of legislation under the name of 'Import of Drugs Bill' was introduced in the Central Legislative Assembly and went to the Select Committee stage in October last, 1937. It would appear from the statement of objects and reasons accompanying the Import of Drugs Bill, that the manufacture, storage and sale of drugs, as also the control of pharmacists and pharmaceutical education, were essentially for provincial governments to deal with, that the Government of India were precluded on technical grounds from undertaking the necessary legislation, covering all aspects of importation, manufacture, storage and sale of drugs without the permission of the provincial governments concerned. Strong protests against this piece-meal legislation were expressed by the representatives of the drug industry all over India as also by the representatives of the pharmaceutical profession. In its issue of 21st March, 1938, the leading daily paper of India, the *Statesman*, in an editorial pronounced the Import of Drugs Bill as 'a very inadequate measure of defence against the evil it aims at overcoming' and remarked that 'what the Government of India is doing cannot be regarded as action as a whole, for the Bill deals only with imports and importers, a limitation that will certainly not put an end to adulteration but will put honest importers at the mercy of the dishonest manufacturers or distributors in this country'. The *Indian Medical Gazette* also made a plea for instituting 'action as a whole', as recommended originally by the Drugs Enquiry Committee. In fact it was clearly felt on all sides that any piece-meal legislation would defeat the object for which Indian public opinion has been agitating for such a long time. It no doubt augurs well for the future of the Indian Drug Industry and all connected with it, that the Select Committee was adjourned *sine die* after expressing the opinion that the proposed legislation is only a half measure and to be of real benefit to the country, it must be substituted by a more comprehensive legislation embracing all-India within its scope on the lines of the recommendations contained in the report of the Drugs Enquiry Committee.

The Central Government had their difficulties, as under the new constitution it cannot undertake such a legislation without the explicit consent of the provinces. Opinions of the provincial governments were, therefore, invited with regard to this important question. It is pleasing to note that most of the provinces have not only agreed to the enactment by the Central Legislature but some are even contemplating passing their own legislative measures to control manufacture and sale of drugs within the area under their jurisdiction. All legal difficulties and the question of jurisdiction between the central and provincial subjects have thus been settled and it may be confidently hoped that there will be no further delay in placing the All-India Drug and Pharmacy Control Legislation on the statute book in the near future. A complete legislation covering both drugs and pharmacy will undoubtedly remedy the crying need of this country in the matter of drug control. A representative body such as yours which is vitally interested in this question should do all that is possible towards the attainment of this object. The Government of India, I feel sure, will be only too glad to give due consideration if you can present your case to them.

Building up a profession of pharmacy

Lastly, I wish to impress on you, gentlemen, that the changes necessary for the building up of a profession of pharmacy on sound lines cannot be effected at once. Time, hard work, and patience are needed but there is no reason to be pessimistic. With the aims and objects of the association always before us and with the active co-operation of members drawn from the ranks of manufacturing pharmacists, pharmaceutical chemists and members in active drug trade, we can and should be able to develop a unique organization which will work in unison towards promotion of the interests of ethical drug trade and stand solidly against all sorts of base and nefarious practices such as drug adulteration, price cutting, tampering with quality, etc. It is quite possible for the association to develop a code of ethics and to foster a feeling of good-will amongst all who are directly or indirectly interested in drugs from the academic and scientific point of view and from the point of view of public utility. It is reassuring to see that there is already some evidence of a greater interest being displayed in this direction among all concerned and I may confidently hope that the problems, though difficult, will ultimately be satisfactorily solved. If pharmacy has been able to attain its rightful place in other countries, it is not impossible for it to attain a similar position in India if only you have the will to do it. I have every hope that this association will be able to organize and carry out the important work of up-lift with utmost zeal and energy.

It only remains for me to express my sense of deep appreciation and gratefulness to those who have worked on behalf of the association during the past year. I am particularly indebted to my friend, Prof. B. N. Ghose, who carried on the duties of the President while I was away in England and who has never grudged his co-operation whenever approached. To my former pupil and now my co-worker, Dr. B. Mukerji, the General Secretary, and to Mr. P. Das, the Organizing Secretary, I am grateful for the many ways in which they have served as official representatives of the association and have contributed to the well-being of the association. I know that wherever they have gone they have made friends for us and have clearly demonstrated the advantages to be gained by making these broader contacts. The members of the council have been very helpful, as have also those who have given freely of their valuable time to committee work.

In conclusion, I thank you once again for the great honour you have done me.

R. N. CHOPRA, C.I.E., K.H.P., M.D.,
SC.D. (Cantab.), F.R.C.P. (Lond.),
BREVET-COLONEL, I.M.S.,
President, Bengal Pharmaceutical Association.

SUMMARY OF TUBERCULOSIS NEWS FOR THE MONTH OF SEPTEMBER 1938

I. *Carlo Forlanini institute scholarship.*—In response to an invitation from the International Union, the King George Thanksgiving (Anti-Tuberculosis) Fund invited applications through the provincial anti-tuberculosis sub-committees and the principals of the medical colleges for the award of six scholarships for the study of tuberculosis at the Carlo Forlanini Institute, Rome. The fund committee approved two candidates for these scholarships, and information has now been received that one of the candidates, Dr. B. S. Ramana, B.SC., M.B., B.S., officer-in-charge, Anti-Tuberculosis Clinic, Mysore City, has been finally selected by the executive committee of the International Union for a scholarship tenable from 15th November, 1938, to 15th July, 1939.

This is the third occasion on which a nominee from India has been selected for this foreign scholarship, the previous awards having been made in 1933 and 1934.

II. *Medical post-graduate course in tuberculosis.*—The King George Thanksgiving (Anti-Tuberculosis) Fund has decided to hold a medical post-graduate course in tuberculosis at the Mayo Hospital, Lahore, from 14th November to 10th December, 1938. Tuberculosis specialists and medical superintendents of some of the tuberculosis sanatoria in India will deliver

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lectures on various aspects of the subject, in addition to practical demonstrations, etc.

III. *Tuberculosis clinic at Arrah.*—A tuberculosis clinic has been started at the local Sadar Hospital, Arrah. A new site for an independent tuberculosis clinic has been selected by the provincial tuberculosis officer. The construction work will start shortly.

IV. *H. E. the Marchioness of Linlithgow's Appeal for the King-Emperor's Anti-Tuberculosis Fund.*—The seventeenth list of subscription to H. E. the Marchioness of Linlithgow's Appeal for the King-Emperor's Anti-Tuberculosis Fund issued by the Honorary Treasurer shows that Rs. 52,51,477-3-9 have actually been received up to 18th August, 1938.

THE TRANSACTIONS OF THE MEDICAL COLLEGE REUNION. NINTH SESSION, 1937–38

THE Annual Reunion of past and present students of Calcutta Medical College is an event of considerable interest to the members of the medical profession in Calcutta. A number of scientific meetings and demonstrations are held during each session, and papers mostly of interest to general practitioners and medical students are read at these meetings. In their *Transactions* the papers read during the ninth session of the Reunion are collected.

The *Transactions* is divided into six sections, *viz,* general, the sections of medicine, tuberculosis, surgery, and midwifery, and the students' section. The first section contains, besides an introduction dealing briefly with the history of the Calcutta Medical College Reunion, the important speeches on general subjects, delivered during the session. Most of these speeches deal with the problems of medical education—undergraduate and postgraduate—a subject of vital interest to the profession and to educationists, particularly at the present time. The medical curriculum consists nowadays of highly complex and advanced specialities of which little was known thirty years ago. This leaves relatively less time for the students to study the cases in the wards and the out-patients' departments, and to learn everyday surgical and obstetric technique. In the speeches of Major-General P. S. Mills, I.M.S., Surgeon-General with the Government of Bengal, and Lieut.-Colonel T. C. Boyd, I.M.S., are to be found practical suggestions as to what sort of training should be given to the students, so that they may turn into good general practitioners. The first principle of teaching institutions in India should be to turn out good general practitioners, for the general practitioners are the mainstay of the profession and on them the medical relief of the public mostly depends.

Most of the articles published are well written and the subjects chosen are of great interest to the profession. But some of the papers such as those of oscillometry, the nature of toxin, the studies of enzymes, and on the ergot preparations will be appreciated mainly by specialists and research workers on the respective subjects.

It is difficult to choose any paper for special mention, but in the section of medicine, the article on the treatment of malaria, which removes many misconceptions regarding the synthetic anti-malarials, and those on sulphanilamide and on diabetes will be read with great interest by the general practitioners. In the section of tuberculosis, Dr. P. K. Sen draws attention to after-care of the tuberculous patient, an important subject to which sufficient attention has not been paid in this country before.

In the section of surgery the papers dealing with the treatment of empyema in children and on the management of compound fractures are worthy of special mention.

In the section of midwifery, the article on the treatment of anæmia in pregnancy, in which Colonel P. F. Gow has given the records of ten cases in which specific treatment in the form of iron or liver, or both combined, had failed to produce any improvement but the patients responded to repeated blood transfusions, is important from the point of view of practical obstetrics but of little interest to the hæmatologist.

The format of the *Transactions* is very satisfactory. There are a few printing mistakes but compared with similar publications in India it is particularly free from them. In the students' section a record of academic achievements of the students might have been included as well as the records of activities of the athletic and dramatic sections of the students' club. However, the originators of the idea of publishing the *Transactions* and the scientific sub-committee of the Reunion who carried it through so successfully are to be congratulated on their first effort. It is a high class and instructive publication which students, old and new, of the Medical College and other practitioners will find of great interest and practical value.

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*THE BRITISH JOURNAL OF RHEUMATISM**

THE cases for and against specialist journals have many times been stated in these columns.

Despite the dangers associated with the segregation of any subject in a specialist journal, a time comes in the life of a branch science when the question of the publication of a journal of its own has to be faced.

The case in favour of this particular journal as presented by the originators is as follows:—

'Rheumatism, although a term incapable of definition, is nevertheless useful in the designation of a group of affections which, although connected with and sometimes changing into each other, yet differ considerably in their respective assemblages of symptoms and methods of treatment.

Its prevalence has long been regarded as a serious menace, not only to industrial efficiency but to the general well-being of the nation. The actual facts regarding the extreme seriousness of its incidence only became known as the result of an enquiry instituted by the Ministry of Health about thirteen years ago.

It is a matter of no small wonder that up to the present no journal devoted entirely to the study of rheumatism in all its aspects has made its appearance. It is, therefore, judged that a wide welcome awaits a paper which, being published in complete independence of any institution or particular viewpoint, can bring all schools of thought together within its covers and present a survey of the progress made in every field of investigation.

The general practitioner wishes to know what the consultant or the man who specialises in rheumatic complaints thinks about this or that question, while the consultant has a great deal to learn from the general practitioner; also the gynæcologist, the dentist, psychiatrist, orthopædic surgeon, pathologist and radiologist have each a contribution to make to the stock of general knowledge. How can the exchange of ideas on these lines take place in the absence of an adequate medium?

It is to supply this urgent need for a journal to deal with the problems which are cropping up every day that *The British Journal of Rheumatism* is being started.

Contributors will be drawn from those working in every phase of rheumatism in this and other countries, and the editorial staff will be glad to receive original papers, descriptions of clinical cases, and similar material.

It will appear quarterly at first and will contain about half a dozen articles on various aspects of the rheumatic diseases by well-recognized authorities. All writers will be requested to pay special attention to the treatment side of whatever they are dealing with. Each issue will include a leading article. Books will be reviewed and interchange of views by correspondence will be encouraged. The fullest information will be supplied about post-graduate instruction.

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*The *British Journal of Rheumatism*. Published quarterly by Messrs. Baillière, Tindall and Cox, 8, Henrietta Street, London, W.C.2. Annual Subscription:—12*s.* 6*d.* Post Free. Single copies:—3*s.* 6*d.*

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From time to time, special numbers dealing with perhaps one branch of the subject will be published; for example, a number might be devoted to gout, another to osteo-arthritis or rheumatoid arthritis, and so on.

It is hoped that all those working in the field of rheumatism will co-operate to help to make *The British Journal of Rheumatism* a useful publication and a worthy representative of British medicine.'

Our only criticism of the above case is, Will the average practitioner be able to afford to purchase this journal, only one of a large number of specialist journals all dealing with one or another of the subjects about which 'he wishes to know what the consultant and specialist thinks'?

For the journal itself we have nothing but praise. The first number contains a foreword by Lord Horder and articles by a number of well-known British writers, Sir Leonard Hill, Sir William Willcox, Dr. Leonard Findlay, Dr. A. H. Douthwaite, Dr. C. B. Heald, and many others.

The quality of the articles is what one would expect from physicians and writers of this calibre, and the format of the journal is excellent; one of its great qualities is its lightness.

We can strongly recommend this journal to all those interested in the subject, and wish it the success it deserves.

*DIGEST OF TREATMENT**

The 'digest' habit is very firmly rooted in America. Few apparently have time to read the real thing, and therefore they purchase and read a 'digest'. Medical literature is so voluminous that it is scarcely possible for one man to read even the titles of the articles in journals published in the English language alone, and certainly no one has the leisure to read through one-tenth of such articles. This 'digest' is therefore very welcome.

The idea of the journal is not of course original, but, what is more important, it has been carried through very satisfactorily. The format of the journal is good—it is small and handy but the print is easy to read. The articles are well chosen and the condensation has been carried out judiciously; few articles cover more than three pages but all essential details are given. So far most of the extracts have been taken from British or American journals, but there are a few from German and other foreign journals rendered, of course, into English.

To a practitioner who wishes to extend the scope of his reading we can certainly recommend this journal.

TENTH INTERNATIONAL CONGRESS OF MILITARY MEDICINE AND PHARMACY

The forthcoming International Congress (10th) of Military Medicine and Pharmacy will be held in Washington from 7th to 15th May, 1939. Invitations to participate have been sent to every country by the President of the United States and already acceptances have been received from several countries. A full scientific and social programme has been arranged and will shortly be mailed to all the countries to which invitations were sent. A large registration is hoped for and every effort will be made by the committee in charge to make the Congress an attractive one to those participating. General Charles R. Reynolds, the Surgeon-General of the United States Army, will be the President of the Congress. Registration is open to all officers of the medical services of the Army, Navy, Air and Colonial services, National Guard, territorial forces and public health service, whether active or reserve.

Colonel Harold W. Jones of the Army Medical Corps is Secretary-General. The Secretarial Office is at the Army Medical Library, Washington, D.C.

* *Digest of Treatment.* Published monthly by Messrs. J. B. Lippincott Company, London (16, John Street, Adelphi, W.C2). Yearly subscriptions:—25*s*. Post free. Not sold separately.

BOMBAY BIRTH CONTROL CENTRE

The Secretary, Birth Control Research Committee, Vile Parle, informs us that the number of people who visited and sought advice at the Birth Control Centre, 166A, Vincent Road, Dadar, Bombay, conducted by the Birth Control Research Committee of Vile Parle, during the quarter ending 15th September, 1938, was 605 out of which 393 were males and 212 females. The total number from the beginning was 1,240.

THE INTERNATIONAL PHYSICIAN'S LUNCHEON CLUB

The International Physicians' Luncheon Club of New York extends a most cordial invitation to physicians visiting New York to be honoured guests at an excellent international luncheon, at the same time offering the services of the members of the Club for any information they may desire.

While guests are not requested to make speeches, any useful information they wish to give informally will be greatly appreciated as fostering medical progress and international goodwill among physicians from all over the world. Luncheon is served at the International Medical Centre, 135, East 55th Street, New York, every Tuesday punctually at 1 o'clock and is over about 2 o'clock.

Physicians are kindly requested to inform the Club of their presence not later than 9 a.m. Tuesday by telephoning Wickersham 2-7900, or writing International Physicians' Luncheon Club, 135, East 55th Street, New York.

TRUSTEE OF THE RANCHI EUROPEAN MENTAL HOSPITAL

The Surgeon-General with the Government of Bengal has been re-appointed as a trustee of the Ranchi European Mental Hospital, with effect from the 1st September, 1938, representing the Province of Bengal.

THE FACULTY OF TROPICAL MEDICINE AND HYGIENE, BENGAL

The following students are declared to have passed the L.T.M. Examination, Session 1938.

Passed

(Arranged in alphabetical order)

Aaron Devasagayam, L.M.P., private practitioner.
Abdur Rahim, L.S.M.F., in charge, Rural Dispensary, District Lyallpur.
Parma Nand Awasthi, L.S.M.F., private practitioner.
Rajendra Nath Barah, L.M.P., private practitioner.
Bhagwan Das, L.S.M.F., private practitioner.
Chaman Lal Bhatnagar, L.C.P.S., private practitioner.
Jagadindra Nath Bhattacharjee, L.M.F., Medical Officer, Gopalpore Tea Estate, Jalpaiguri.
Gopal Chandra Bhowal, L.M.F., Assistant Medical Officer, Sessa Tea Estate Hospital, Dibrugarh.
Kali Charan Chakravarty, L.M.F., Assistant Medical Officer, Paneery Tea Estate, Assam.
Nitya Ranjan Chakravarty, L.M.F., Honorary House Surgeon, S. K. Hospital, Mymensingh.
Sushil Ranjan Choudhury, L.M.F., private practitioner.
Chapala Nath Chowdhury, L.M.F., Honorary Medical Officer, Bogra District Board.
Sudhangsu Kumar Das, L.M.F., private practitioner.
Lila Das Gupta, L.M.F., Honorary Clinical Assistant, Campbell Hospital, Out-Patients' department.
Rihani Ganesh Datta, L.C.P. & S., private practitioner.
Vithal Govind Deshpande, M.B., B.S., Assistant Surgeon, B. B. and C. I. Rly., Ajmer.
Faqir Chand, L.S.M.F., I.M.D., Government of India.
Khawaja Nasir Uddin Ghori, L.S.M.F., S.A.S., Police Hospital, Ajmer.

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Sidheswar Gupta, L.M.F., private practitioner.
Wazir Chand Jolly, L.S.M.F., private practitioner.
Govind Prasad Kapoor, L.S.M.F., private practitioner.
Benoy Bhushon Kar, L.M.P., private practitioner.
Faqir Chand Khandpur, L.S.M.F., private practitioner.
Jagdish Chandra Kharabanda, L.M.P., private practitioner.
Prabh Diyal Khatri, L.M.P., private practitioner.
Satya Pal Khosla, L.M.P., private practitioner.
Sudhanshu Kumar Kundu, L.M.F., Resident Medical Officer, Katalguri Tea Estate.
Joginder Singh Lamba, L.S.M.F., private practitioner.
Nil Kanta Lodh, L.M.F., Assistant Medical Officer, Pathecherra Tea Estate, Assam.
Broja Gopal Misra, L.M.F., private practitioner.
Jatindra Nath Mukherjee, L.M.F., Medical Officer, Jagatnarain Charitable Dispensary, Singur.
Sukhendu Bikash Nandy, L.M.F., private practitioner.
Benoy Krishna Nayak, L.M.F., House Surgeon, Burdwan Fraser Hospital.
Kalendri Prasad Nigam, L.S.M.F., private practitioner.
Moreshwar Govind Pendse, L.M.P., private practitioner.
Shambhoo Nath Saksena, L.M.P., L.P.H., Medical Officer of Health, Municipal Board, Amroha, District Moradabad.
Sadashiv Sitaram Sapre, L.M.P., private practitioner.
Ganpat Narain Saxena, L.S.M.F., private practitioner.
Baidya Nath Sen Gupta, L.M.F., private practitioner.
Bhubon Mohon Sen Gupta, L.M.F., Demonstrator of Anatomy, Ronaldshay Medical School and Radiologist, Fraser Hospital, Burdwan.
Kashi Nath Shukla, L.M.P., Sub-Assistant Medical Officer, Nagpur District.
Shiva Swarup Varma, L.S.M.F., private practitioner.
Aileen Beatrice Vining, M.D., L.M.C.C., L.M.S., Medical Officer, Women's and Children's Hospital, Pithapuram.

Current Topics

Treatment of Ulcerative Colitis with Aluminum Hydroxide and Kaolin

By J. B. EYERLY, M.D.
and
H. C. BREUHAUS, M.D.

(Abstracted from the *Journal of the American Medical Association,* Vol. 109, 17th July, p. 191)

ONE of the oldest remedies brought down to present-day medicine is kaolin (aluminum silicate). It is one of the chief products of the erosion of igneous rock and therefore is a common constituent of many soils and is classified as a silicious earth. Rich deposits of high grade kaolin are found in parts of the United States and also in the Orient, where it is mined chiefly for use in pottery and was used very effectively in the treatment of Asiatic cholera many centuries ago.

Both Walker and Braafladt were impressed by the great usefulness of this product in the treatment of the 1919 epidemic of cholera in China. In giving it both by mouth and by rectum it proved to be one of their most useful aids in bringing about a great decrease in mortality. Walker in discussing the rationale of kaolin concluded that its action was twofold. First, there is a mechanical action, because large numbers of bacilli are enclosed and carried off but are not killed. Second, by adsorption the kaolin takes up toxins. Braafladt also studied the action of kaolin in both normal and pathologic conditions. He concluded that it carries down large numbers of bacteria from fluid mediums if it is kept in motion. The latter consideration is important because kaolin, although it has some colloidal activity, has a tendency to settle out of a liquid medium and thus its large surface area for adsorptive purposes is lost. When kaolin settles out from suspension, a firm, tenacious, claylike mass results (bolus alba) which may lead to serious fæcal impaction in the rectum. He also found that various pathologic bacterial toxins were neutralized. He emphasized the proteolytic action of these bacteria and observed that when kaolin is taken by mouth for a period of from ten to thirty days in doses of from 1 to 2 ounces (30 to 60 gm.) a change in flora to an aciduric type may be accomplished. *B. welchii* was practically eliminated from the stools in these experiments. It is interesting to note that Dragstedt found kaolin as useful as a high lactose diet in preventing thyroparathyroidectomized dogs from going into tetany.

Kaolin is a common constituent of many soothing powders, chiefly by virtue of its inert, highly adsorptive property. Hektoen and Rappaport found it useful in cases of diphtheria, applying the dry powder to the nose and throat at intervals of two hours. They explained its action as a physical one in that practically all pathogenic bacteria were removed in from three to four days. In severe pharyngitis they obtained excellent results by having their patients swallow one-third teaspoonful four or five times per hour during the day.

Aluminum hydroxide is somewhat similar to kaolin but has greater colloidal activity. It settles out of suspension less readily and forms a light viscid gel. Under certain conditions it is capable of acting as either a weak acid or a weak base; this property alone has made it popular in the treatment of peptic ulcer. It also has a moderate astringent action and causes a mild dryness and puckering of the mucous membranes of the mouth when taken orally. Because of the increased colloidal and astringent action, its value as an addition to kaolin readily becomes apparent.

Neuman in 1914 was one of the first to report the use of aluminum hydroxide in bringing about a more rapid line of demarcation and healing in gangrene. He accredited this to its protective power and ability to neutralize acids as well as other toxic products. Zuverkalov and Salomkin found that hog cholera virus might be adsorbed by aluminum hydroxide from blood and urine at a pH of five. By iso-electric precipitation of the protein, the virus could be precipitated but the supernatant fluid also contained the virus. They found the adsorption to be reversible in that the virus could be eluted with phosphate and aminoacetic acid (glycine). Complete adsorption could not be obtained when up to 2 per cent aluminum hydroxide was used.

Clifton reports that staphylococcus bacteriophage can readily be adsorbed by aluminum hydroxide. This too could be eluted by using a secondary ammonium phosphate solution.

Differences in the adsorption of diphtheria toxins by aluminum hydroxide are recognized. Schmidt used purified diphtheria vaccines of the same titre and noted that they were adsorbed in varying degrees by the same amount of aluminum hydroxide. Roughly, the adsorbability of the vaccine was related to the nitrogen content of the salt-free preparation, but different adsorbability was found in samples of similar nitrogen content.

Knowing that there was little doubt about the ability of aluminum hydroxide to adsorb toxins, we were interested in studying its neutralizing effect. When 1.10 minimum lethal doses of a stock diphtheria toxin was mixed with 5 c.c. of a 3 per cent aluminum hydroxide suspension and shaken thoroughly and then injected into a guinea-pig, the animal was sick on the fourth day and recovered. Any larger amount of this

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toxin resulted in death of the animal within twenty-four hours. While this apparent protective action may have been due to the slowing of absorption of toxin, it may also have resulted in part from segregation of the toxin by adsorption.

The varying ability of this chemical to adsorb diphtheria toxin may be just as applicable to toxins from other sources and its neutralizing capacity thus also vary. When one deals with a toxin in the alimentary tract the situation is entirely different from that in an enclosed body cavity and, even though the toxin is not neutralized, anything that would adsorb or prevent its absorption by the body until it is eliminated would be beneficial.

It is important that the kaolin and aluminum hydroxide be as chemically pure as possible. Any impurity changes colloidal activity and may lead to disappointing results. Small quantities of alkali cause kaolin suspensions to settle out into a firm mass. On the other hand, alkali affects the mixture of aluminum hydroxide and kaolin in an opposite manner and gives a greater bulk with a firmer gel.

The normal flora of the colon is mildly aciduric, and relatively few of the proteolytic or Gram-positive organisms are seen. When proteolytic organisms preponderate and the normal intestinal action is disturbed, the re-establishment of an aciduric flora is often difficult. It seemed worth while to try aluminum hydroxide and kaolin for this purpose. Braafladt stated that by feeding kaolin alone he could remove the putrefactive organisms and produce an aciduric flora. Neither we nor Swalm were able to produce this change, though the latter was able to establish an acidophilus culture with a mixture of kaolin and aluminum hydroxide. In several feeding experiments on dogs and rats we were never able to reduce the Gram-positive organisms below 20 per cent in rats and 50 per cent in dogs

Swalm used a kaolin-alumina mixture in treating many gastro-intestinal disorders and found that 86 per cent were definitely improved by addition of this medication to the general therapy. He stressed its local action in the lumen of the stomach and intestine through its mildly astringent and adsorptive properties and believes it to be most useful in hypermotile states.

Toxicity of aluminum

Aluminum in minute quantities is found normally in the tissues of animals. There is little evidence that any harm results in the amounts in which it is likely to be consumed. Without question some of the more soluble forms, such as alum or aluminum chloride, are quite toxic and even fatal when taken in large quantities. Underhill and Peterman, using biscuits made with alum baking powder, found that the metal was readily absorbed and excreted in the bile and urine. When given in large doses it is chiefly stored in the liver, spleen, brain and thyroid gland. The same authors injected aluminum chloride and sulphate into rabbits and rats, producing changes similar to lead poisoning.

Seibert and Wells fed large amounts of the various forms of aluminum to rabbits and produced varying degrees of toxic changes in all animals. They concluded:

The strongest evidence, however, that the feeding of aluminum compounds in any form, including that supposed to be so insoluble and inert as aluminum hydroxide, may be harmful lies in the results obtained in the feeding experiments with large single doses of aluminum compounds. Quick responses such as decreases from two to three million in the number of erythrocytes and of as much as 20 per cent in the hæmoglobin were noted in a day or two following the injection of large doses of aluminum in the form of . . . metallic aluminum and the granular, insoluble aluminum hydroxide.

In spite of these results we feel, as others have shown, that small doses of aluminum, especially of such an insoluble form as aluminum hydroxide and kaolin, will result in no harm. Relatively large doses of both these compounds when fed to dogs by stomach tube over a period of three months produced no untoward results. Aluminum hydroxide has been used for several years in the treatment of peptic ulcer without any evidence of toxicity. In Swalm's sixty-five cases treated with a kaolin-alumina mixture, no harmful results were noted.

To determine the effects of relatively large doses of kaolin and aluminum hydroxide when taken by mouth, two dogs were fed 2 ounces of these substances by stomach tube for six days each week over a period of three months. Dog 1 was a normal appearing male and weighed 26½ pounds at the beginning of the experiment. It was given 2 ounces of kaolin suspension between 10 and 11 each morning for six mornings a week over a period of three months. The diet consisted of a single feeding of scraps given about 12 noon. At no time was there any evidence of ill health, but occasionally a rather firm chalky stool was passed. After twelve weeks the animal had gained one-half pound and was in excellent condition. At this time the dog was killed and a thorough post-mortem examination showed no changes worthy of note.

Dog 2 was a normal appearing adult male and weighed 25 pounds at the beginning of the experiment. It was given 2 ounces of a 3 per cent aluminum hydroxide suspension and managed in the same manner as dog 1. This dog also remained normal in behaviour and appearance during the three months. It lost one-half pound but at all times passed normal stools. At autopsy no change in any tissues or organs was found except two small roundworms in the first part of the ileum.

Histologic examination of the liver, kidney, spleen, brain, heart, lungs, adrenals, stomach, small and large intestines and mesenteric lymph nodes of both these animals showed no changes worthy of note. These were stray dogs and had been in the laboratory only a few days before the experiments were begun. Such animals usually gain a few pounds when confined and put on a diet of scraps. The fact that they practically maintained their original weight is significant. Since no pathologic changes could be found, it seems quite probable that the administration of aluminum hydroxide and kaolin reduced the effectiveness of the digestive juices.

Method of administration

It has been customary to give kaolin or a mixture of kaolin and aluminum orally. Except for lesions in the upper gastro-intestinal tract, this method has certain limitations. Walker and Braafladt found that a combination of both oral and rectal administration was most effective. When the patient was sufficiently recovered, they gave kaolin only by mouth. Walker realized the possibility that kaolin might also take up the digestive juices and found that rennin would be adsorbed when it was filtered through a kaolin bed. Swalm also considers this factor and advises that such a mixture should not be given by mouth over too long a period of time.

In ulcerative colitis there is a raw ulcerating mucous membrane, and thus to obtain the maximum benefit from kaolin and aluminum hydroxide we give it only by rectal retention. First, the colon is cleansed with a pint of warm water. In one hour this is followed by a retention enema consisting of a 3 to 5 ounce (60 to 150 gm.) mixture of kaolin and aluminum hydroxide in from 3 to 5 ounces (90 to 150 c.c.) of warm distilled water. The patient is instructed to retain this as long as there is no discomfort. Usually one retention a day is sufficient, but occasionally two are given. In this manner, larger doses of the mixture can be brought into direct contact with the inflamed mucous membrane without previous admixture with food and digestive juices.

Report of cases

Case 1.—A white woman, aged 35, entered the hospital, 16th August, 1934, complaining of intermittent diarrhœa and blood in the stools for six years. There were from four to twenty stools in each twenty-four

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hour period. There was no abdominal pain but considerable tenesmus. The patient had lost 65 pounds. The past history was essentially negative except for the usual childhood diseases.

The patient was anæmic and emaciated. The abdominal muscles were relaxed; the descending colon was palpable, firm and sensitive. A soft systolic murmur was heard near the apex; otherwise there were no physical observations of note.

The stools were liquid and contained gross blood, clumps of leukocytes and considerable mucus. No parasites were found in either freshly examined or cultured specimens. A good growth of Gram-positive diplococci was obtained in the blood agar culture.

An Ewald test meal showed 50 points of free hydrochloric acid and 75 points of total acidity.

The proctoscope was inserted without difficulty. The mucous membrane was œdematous, dark red and covered with a dirty gray tenacious exudate which, when removed, uncovered a raw, bleeding surface. No distinct ulcers were seen.

A therapeutic test with carbarsone was given without benefit. Acriflavine 1 : 3,000 irrigations were used each day for some weeks without improvement. A 15 per cent bismuth subgallate suspension in mucilage of acacia as a retention enema was given for three weeks without change. An autogenous vaccine made from the stools was given for six weeks without benefit.

The patient was then given aluminum hydroxide and kaolin retentions once a day. Within two weeks a definite improvement was noted. The retentions were continued for six months, at which time she had gained 40 pounds. The retentions were discontinued and the patient is continuing to pass on an average two normal soft formed stools each day. Proctoscopic and fluoroscopic examinations reveal a normal appearing membrane and the presence of the normal haustral markings.

Case 4.—A white man, aged 66, had been in poor health for some time before entering the hospital, 9th October, 1935, with complete urinary obstruction. An emergency cystotomy was performed. At that time the blood chemistry showed total non-protein nitrogen 97.6, urea nitrogen 66.6, creatinine 3.9. He was given a transfusion of 460 c.c. of whole blood, and twenty days later a suprapubic prostatectomy was performed. At that time the blood chemistry showed total non-protein nitrogen 53.3, urea nitrogen 22.8, creatinine 1.7. The hæmoglobin had increased from 60 per cent to 70 per cent, the red blood cells from 3,110,000 to 3,950,000, and his condition in general was greatly improved.

Three days after the prostatectomy he began to pass frequent liquid stools containing macroscopic blood, clumps of leukocytes and mucus. Methylene blue was injected into the bladder but none was recovered in the stools. On rectal examination there was no opening through the rectal wall. Proctoscopic examination up to the rectosigmoid junction revealed a red œdematous mucous membrane covered with much mucus. The mucous membrane bled readily wherever touched; no distinct ulcerations were seen. Several fresh specimens were examined and cultured on liver serum but no amœbas were found. Culture on blood agar yielded an abundant growth of *Streptococcus viridans*.

The patient was given retentions of aluminum hydroxide and kaolin once a day. After five days the medication was discontinued. The stools were formed and microscopically negative.

Case 6.—A white woman, aged 29, entered the hospital, 22nd January, 1936, complaining of diarrhœa for one year, passing from four to six liquid stools containing gross blood each day. She had considerable abdominal distress.

The past history was negative except for the usual childhood diseases.

Physical examination was essentially normal except that the patient appeared anæmic.

The stools were liquid; they contained gross blood and leukocytes in clumps. Examination of fresh and cultured specimens revealed no parasites. On Endo and blood agar plates an abundant growth of non-hæmolytic *B. coli* was obtained.

An Ewald test meal showed 25 points of free hydrochloric acid and 55 points of total acidity.

The rectal mucous membrane was œdematous and many shallow ulcers from 1 to 3 mm. in diameter were seen. When the tenacious gray exudate was removed, a raw bleeding surface remained.

A barium sulphate enema showed a decrease both in the diameter of the descending colon and in the haustral markings.

A therapeutic test with carbarsone produced no change. Aluminum hydroxide and kaolin were given. After eight weeks the temperature was normal and a slight tendency to constipation existed. One month later she had gained 12 pounds and was passing one normal stool daily. Retentions were discontinued. Two months later there was a recurrence of diarrhœa. At that time the rectal mucosa was found to be considerably injected but no ulcers were seen. Retentions were resumed for six weeks. At present the patient passes one or two formed stools without gross blood each day. The appetite is excellent, a gain in weight is resulting and the condition in general is greatly improved.

Comment

In a review of these cases it is noted that the therapy employed is not unlike the various methods generally found useful in treating ulcerative colitis.

The diet must be of high caloric, non-irritating type and contain all vitamins necessary for normal health. Opium in some form is frequently used in the early stages if pain and excessive diarrhœa are present. A consistent programme carried out intelligently is essential if such cases are to be cured.

Conclusions

Investigation by others and our clinical study support the belief that the treatment of ulcerative colitis by aluminum hydroxide and kaolin mixture is rational.

The adsorption of bacteria and their products reduces irritation and decreases the absorption of toxins.

The astringent action lessens absorption and the transudate from the inflamed surfaces is diminished.

It is not toxic.

There is no admixture with food and digestive juices.

A neutral reaction in the lumen of the bowel is preserved.

No bolus nor impaction formation occurs with moderate care.

Modern Concepts of Diabetes and its Treatment

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(Abstracted from the *Medical Press and Circular*, Vol. CXCVI, 12th January, 1938, p. 28)

Introduction

The developments of the past fifteen years have created an entirely new conception of diabetes mellitus and its treatment. Diabetes promises to become one of the major social and economic problems in the future. This prediction is based mainly upon the established hereditary nature of the disease. The following statement was recently made referring to the United States of America: 'In all probability one-fourth of the population are carriers of the tendency to diabetes which they may transmit to their own offspring. We have no way at present of selecting those destined to become the diabetics of to-morrow and the next year'.

The nature of diabetes

While diabetes presents a challenge to preventive medicine, the nature of the disease introduces an obstacle in the path of efforts towards its eradication.

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In common with many chronic non-specific diseases, diabetes is not the result of a single etiological factor. Most cases of the disorder arise from the combined effects of two influences: (1) a predisposing cause, and (2) an activating or exciting cause.

The exciting cause of diabetes is often obvious, and includes such factors as infections, arteriosclerosis, obesity, emotional strain, trauma, thyrotoxicosis, and altered function of the pituitary gland. The evidence in favour of the inheritable potentialities of diabetes is incontestable. Indeed, diabetes may be regarded essentially as an hereditary tendency which is subject to activation by various precipitating factors of exogenous or endogenous origin.

The diagnosis of diabetes

The diagnosis of diabetes is either very easy or very difficult. The disease is discovered almost as frequently by accident during the course of a routine medical examination as through the recognition of the typical diabetic symptoms. The most common sign of diabetes is glycosuria, but the discovery of glycosuria does not necessarily constitute a diagnosis of diabetes. In association with certain characteristic clinical manifestations and especially when accompanied by ketonuria, glycosuria is pathognomonic.

In evaluating the significance of glycosuria, especially the symptomless variety, one must bear in mind that subtle attribute, the renal threshold for sugar, vagaries of which allow glycosuria to appear at times in the absence of an elevated blood sugar, and prevent glycosuria, at other times, in the presence of hyperglycæmia. A knowledge of the blood sugar concentration, therefore, is imperative for a proper investigation of the carbohydrate metabolism. As a working rule, the finding of a blood sugar of 140 mgm. per cent or higher in the fasting state, or 170 mgm. or more two to three hours after a meal, particularly breakfast, is diagnostic of diabetes. But a person may be a diabetic even although his blood sugar values fall below these figures.

The sugar tolerance test is a valuable aid in the detection of cases of early or mild derangements of carbohydrate metabolism and in differentiating the so-called innocent glycosurias from true diabetes. Two types of innocent glycosuria deserve mention, namely, renal glycosuria and 'lag' glycosuria.

Renal glycosuria.—Following the ingestion of 50 or 100 grams of dextrose, the individual with renal glycosuria presents a normal blood sugar curve, that is to say, the maximum elevation of the blood sugar is not beyond 170 mgm. per cent, and it has returned to the normal fasting level in two hours. The only abnormality is the coincidental occurrence of glycosuria. Ordinarily, glucose does not escape from the blood into the urine in detectable amounts unless the renal threshold or leak point for glucose is exceeded. Normally, the renal threshold lies somewhere between 160 and 180 mgm. per cent of blood sugar, probably nearer 180 than 160. In persons with renal glycosuria, it is presumed to be below this level.

The blood sugar curves must be interpreted with caution, and all factors, especially a positive family history of diabetes, must receive due consideration. Renal glycosuria, like true diabetes, can occur in several members of a family.

'Lag' glycosuria.—The so-called 'lag' type of blood sugar curve is characterized by a sudden steeple-like rise of the blood sugar to an abnormal height, followed by an equally sudden decline to the normal fasting level again within two hours. Because the renal threshold is exceeded, there is a transient glycosuria.

This type of response to the sugar tolerance test was described originally by Maclean, who applied the term 'lag' in connection therewith on the assumption that there was a lag or delay on the part of the liver in exerting its glycogenic function. Individuals so affected were thought to require a higher concentration of sugar in their blood than was usual to stimulate the glycogenic process but, when once started, this function was adequate. Since the phenomenon is exhibited frequently by individuals whose stomachs empty rapidly it would seem that the rapid and excessive absorption of sugar from the intestine is an explanation for its occurrence.

While 'lag' glycosuria is usually considered to be a harmless anomaly, it should, perhaps, be regarded with suspicion.

Improvements of treatment

The general popularity of the higher carbohydrate diets for diabetics speaks for the efficacy of this form of treatment. Likewise, the therapeutic applications of standard insulin are too well known to merit special comment. The outstanding recent advance with regard to diabetes is the introduction of compounds of insulin which, after their subcutaneous injection, exert a prolonged and stabilizing effect upon the blood sugar, in contrast to the unmodified insulin, the action of which is quick, powerful, and evanescent.

Protamine insulin.—Protamine insulin was developed by Hagedorn and his associates in Denmark. It consisted of standard insulin mixed with a protamine prepared from the sperm of a fish and buffered to a reaction of pH 7.3. The compound was found to be relatively insoluble, painless on injection, and not followed by protein shock. The protamine-insulin combination disintegrated slowly in the subcutaneous tissues and the insulin was liberated and taken up by the blood stream gradually over a period of many hours.

It was evident from the numerous published reports of the clinical application of protamine insulin that it was in many instances a valuable adjunct to existing methods of treatment. In spite of the advantages claimed for the original protamine insulin, it had certain shortcomings, and it has been supplanted by a more effective preparation, namely, zinc protamine insulin.

Zinc protamine insulin.—Apparently zinc is intimately concerned with the metabolism of carbohydrates. It had been shown that the action of insulin and protamine insulin was augmented by the addition of small amounts of zinc. It is now generally agreed that zinc protamine insulin has a more prolonged effect upon the blood sugar than the original protamine insulin and it has the added advantage of being supplied in a form ready for use, without the necessity of preliminary mixture with the buffer solution.

The administration of a single injection of zinc protamine insulin causes a gradual reduction of the blood sugar, the lowest point being reached 12 to 24 hours after the injection. One noticeable result of the use of this new insulin is that diabetics are permitted to start their days with a normal or low fasting blood sugar concentration, a status which was difficult to attain with the former available methods of treatment.

The principal advantage of zinc protamine insulin, however, is that it permits, in many instances, the reduction of the number of injections of insulin which are necessary to maintain optimum control of the diabetes. In this respect it is no less a relief to the parents of juvenile diabetics who had to accustom themselves, oftentimes, to the injection of a dose of insulin in the middle of the night and who lived in more or less constant fear of nocturnal reactions.

The chief differences between standard insulin and zinc protamine insulin are that standard insulin acts quickly and zinc protamine insulin acts slowly. Standard insulin is not cumulative in its effect, while zinc protamine insulin exhibits cumulative properties. These guiding physiological principles should govern the usage of the two products and their relative merits must be considered carefully before changing a patient from standard insulin to zinc protamine insulin, or before starting a new case on insulin therapy.

If a diabetic is being controlled satisfactorily on one or perhaps two injections of standard insulin a day and his routine is established, there may be no good reason to switch to the new insulin. On the other

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hand, the individual whose diabetes demands three or four injections of standard insulin every 24 hours has every reason to be hopeful regarding the benefits to be derived from zinc insulin.

There are no certain rules to guide one in the use of zinc protamine insulin. Many mild or moderately severe diabetics can be controlled satisfactorily with but a single injection of the substance each morning immediately before breakfast. Others with more severe grades of diabetes require supplementary injections of the quicker-acting standard insulin to accomplish the desired regulation of the blood sugar.

The zinc protamine insulin, on account of its slow mobilization in the blood stream, is often not adequate for the immediate metabolism of the carbohydrate introduced with the meals, consequently rather marked rises of the blood sugar are apt to occur. This post-prandial hyperglycæmia is especially prone to develop after breakfast. The control of such undesirable fluctuations of the blood sugar may be accomplished by modifying the diet in a way that the carbohydrate value of the breakfast is reduced and that of the other meals increased accordingly. The metabolic strain may be minimized by multiple meals whereby the daily carbohydrate allowance is divided into six or seven small feedings. This is, however, a rather bothersome procedure.

A more satisfactory method is by some combination of zinc protamine insulin and standard insulin. These two types of insulin can be given together mixed in the one syringe in the morning, the standard insulin taking care of the immediate requirements until the zinc protamine insulin begins to act. This is an effective means of combining the two insulins and it is more agreeable than the giving of two separate injections at the one time. Another practice which has been found to be satisfactory in several cases is to give doses of from 10 to 30 units of protamine zinc insulin at noon, with a small dose of standard insulin in the morning and possibly in the evening as well.

Experience has shown that besides reducing the number of injections, the use of zinc protamine insulin has permitted, in many instances, a reduction of the total number of units of insulin necessary for adequate control of the diabetes.

Probably the only definite contra-indication for the employment of zinc protamine insulin is diabetic coma and clinical acidosis, but it may be used to advantage even under these circumstances, in conjunction with standard insulin, to prevent a relapse of the ketosis.

Zinc protamine insulin is not as consistent in its effects as standard insulin. Individuals with severe diabetes treated with zinc protamine insulin frequently have recurrences of the glycosuria for no apparent reason. This may be due to differences in the dispersion of the injections and differences in the vascularity of the tissues. Muscular activity also plays an important part in the regularity of the control of the blood sugar.

A change from standard insulin to zinc protamine insulin should be undertaken gradually in order to avoid the temporary relapse of the diabetes which may occur during the period of readjustment; also, to avoid reactions due to the cumulative action of the protamine insulin. It is advisable, in the light of our present knowledge, to refer the patient to a hospital for the therapeutic transition in order that proper chemical control of the situation may obtain.

In an attempt to transfer a patient from multiple doses of the old insulin to the new zinc protamine insulin, the plan suggested is to discontinue the noon and midnight doses of the old insulin and to give one-half of the total daily insulin requirement in the form of zinc protamine insulin in the morning, together with one-half of the previous morning dose of standard insulin. Also, give in the evening one-half the quantity of standard insulin which had been used formerly at this time. Subsequent adjustments can be made, according to the results of the blood and urine tests over a period of several days, in order to determine the optimum dosage of zinc protamine insulin alone, or in combination with standard insulin, which most nearly satisfies the requirements of the individual patient.

Insulin reactions.—It is true that insulin reactions are not experienced as frequently with the new insulin as with the old insulin. But the hypoglycæmic reactions which do occur as a result of the new insulin are of a severe grade and they differ in certain respects from those with which we had become familiar while prescribing only the standard insulin. The reactions caused by protamine insulin are more subtle in their development and they may occur unexpectedly, with little or no warning. The subjective symptoms are less marked and the skin will likely be dry, in contrast to the profuse perspiration which accompanies the hypoglycæmia occasioned by standard insulin. Lower blood sugar levels are observed in the hypoglycæmia caused by protamine insulin than in that brought about by standard insulin. We have noted the blood sugar to drop as low as 29 mgm. per cent before hypoglycæmic symptoms became manifest. The gradual decline of the blood sugar permits the compensating mechanisms to operate, until finally, when an extremely low blood sugar level is reached, alarming symptoms, even convulsions, may suddenly supervene. Vomiting may occur. The reactions caused by protamine insulin are more intractable than those caused by standard insulin, and there is a tendency to relapses of the hypoglycæmia following the treatment of a reaction. A common time for hypoglycæmia to develop in patients who are receiving zinc protamine insulin is during the early hours of the morning.

Exercise.—Physical exercise is a recognized form of therapy in diabetes, acting in conjunction with diet and insulin. Exercise causes a reduction of the blood sugar in the patient with severe or moderately severe diabetes only if there is a sufficient amount of insulin available in the body at the time of the exercise. As mentioned by others a patient receiving an adequate amount of protamine insulin always has some insulin available in the body. It is to be expected, therefore, that exercise should exert a notable blood-sugar-lowering effect in persons who are treated with this preparation.

Physical activity, therefore, is a factor of greater practical importance with the use of the new insulin than it is with the old insulin. If variations of a patient's activities occur with any regularity and can be predicted, modifications of the treatment, as by varying the insulin dosages or the amount of carbohydrate in the meals, can be instituted to suit the circumstances, and thus prevent hypoglycæmic reactions.

We do not know yet how to use zinc protamine insulin to its best advantage. Therefore, its true rôle in the treatment of diabetes cannot be stated with certainty at present.

Crystalline insulin.—Recently, a crystalline form of insulin exhibiting physiological properties rather similar to those of protamine insulin has been developed in America and studied clinically by various workers: .This product is still under investigation and is not on the market.

The major complications of diabetes

The improvements of treatment have brought about great changes in the character of the complications of diabetes.

Diabetic coma.—Coma, which was the principal cause of death before the introduction of insulin, rarely occurs to-day, but when it does develop, still all too frequently, it is hardly ever fatal. Death from diabetic coma is as inexcusable as death from diphtheria.

The diabetic is not adequately treated unless he and his relatives are taught how to avoid coma. Therefore, the development of coma in a known diabetic, except in rare instances, is a reflection upon the individual's integrity or judgment, or upon the accomplishments of the physician. Coma may be the first manifestation of diabetes. In any case, one has

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to deal with an extremely ill patient, in fact a medical emergency, and the only fair course is to have the patient removed to a hospital with all possible speed. The time intervening between the onset of the acute symptoms and the institution of treatment is most important. For every hour that the state of ketosis exists untreated, the more remote become the chances for final recovery.

The salient features of severe diabetic coma are: dehydration, ketosis, hyperglycæmia, abdominal pain, vomiting, subnormal temperature, rapid pulse, feeble heart action, oliguria (or anuria), increased non-protein nitrogen of the blood and hypochloræmia.

Any plan of treatment must have as its immediate objectives, therefore, the restoration of fluids and electrolytes to the body, the rapid utilization of glucose, the re-establishment of renal function, support to the circulation, correction of the gastric malfunction, and counteraction of the shock factor.

The first step in the management of a coma case is the verification of the diagnosis of diabetic coma. As soon as this is clear, proceed at once with the administration of insulin and fluids, which are the most important items in the treatment.

Outline of treatment of diabetic coma.

1. *Insulin:*

(*a*) 20 units intravenously and 20 units subcutaneously.

(*b*) 20 units subcutaneously every half-hour until there is clinical and chemical evidence of improvement.

The best guide regarding the size and frequency of the insulin dosages in diabetic coma consists of repeated blood sugar estimations.

If circumstances demand that urine specimens only must be relied upon, these should be collected at intervals of one or two hours and the rule is to give:

20 units of insulin for a red or orange test with Benedict's solution;

15 units for a yellow test;

10 units for a yellow-green test; and

No insulin for a green or blue test.

(*c*) Zinc protamine insulin—in view of the urgency of the situation, standard insulin should be relied on in the treatment of diabetic coma, but 50 to 100 units of the zinc protamine variety may be injected for remote effect to prevent a relapse.

2. *Fluids*—by mouth (if possible), subcutaneously, or intravenously. 1,000 to 1,500 c.c. of normal saline interstitially in the axillary spaces, repeated in a few hours if necessary. Water, clear broth (with salt), ginger ale, tea, and coffee may be offered by mouth.

3. *Gastric lavage*—for vomiting and nausea, unless the patient is *in extremis*, is often quite effective.

4. *Cleansing enema.*

5. *Circulatory stimulants*—a low blood pressure is a bad prognostic sign—adrenalin, strophanthin, coramine, caffein, digitalis, blood transfusion.

6. *Hypertonic salt solution for anuria*—50 to 130 c.c. of 10 per cent salt solution may be administered intravenously.

7. *Food*—the utilization of carbohydrate by the patient is imperative to prevent the persistence or the recurrence of the ketosis. The carbohydrate must be presented in a concentrated, readily utilizable form, *e.g.*

(*a*) Glucose—not necessary in the early stages of anti-coma treatment, but should be given when the blood sugar begins to decline: (*i*) intravenously if necessary, 300 to 500 c.c. of 10 per cent solution, (*ii*) in amounts of 5 to 15 grams at intervals in orange juice by mouth if the stomach is retentive. An intake of 100 grams of glucose should be provided during first 24 hours.

(*b*) Resumption or establishment of diet as soon as possible; avoid by all means starvation, particularly carbohydrate starvation. Soft, bland nutrients such as gruel, junket, custard, milk, eggs, bread, pureed vegetables, etc., can usually be started within the first 48 hours.

If the patient fails to respond to the treatment in the expected manner, re-check for possible undetected complications or associated conditions.

Cardiovascular degeneration.—Arteriosclerosis, and all its sequelæ, is the complication *par excellence* of the diabetes of the present day. Some statistics, collected recently by Joslin, indicate that the development of arteriosclerosis in diabetics is being deferred. Nevertheless, fact remains that arteriosclerosis, whether generalized or localized in the heart, the legs, or the brain, accounts for the majority of deaths among diabetics to-day.

Surgical operations on diabetics

Every effort should be expended to permit as little disturbance of the metabolism as possible for the surgical diabetic. In order to prevent post-operative ketosis, carbohydrate starvation must be avoided. Our practice is, except in emergencies, to give the glucose equivalent of the breakfast in conformity with the prescribed diet, preceded by the usual dose of insulin, as early as possible on the day of the operation.

Immediately following the return of the patient from the operating theatre, a sample of blood is withdrawn and the blood sugar concentration is determined at once. According to the result, insulin is or is not given. If the blood sugar be in the neighbourhood of 200 mgm. per cent, 10 units of standard insulin are injected, if it be 300 mgm., 20 units are given.

As soon as it is permissible post-operatively, the patient is encouraged to drink fluids freely. If this is not practical for any reason and especially if vomiting is troublesome, the fluid must be administered parenterally. For the first 24 to 48 hours after an operation the meals are replaced by their glucose equivalent and insulin is injected according to the requirements.

The only cases of post-operative diabetic coma which I have known were those in which the surgical programme was followed out without attention to the diabetes.

A meagre experience indicates that diabetics who are prepared with zinc protamine insulin withstand surgical intervention even better than those treated with standard insulin. At any rate, the cases which have been observed so far did not exhibit a post-operative hyperglycæmia or ketonuria sufficiently marked to require the injection of the rapidly-acting standard insulin. No doubt the persistent supply of insulin within the body stabilized the blood sugar to a much more pronounced extent than we had been accustomed to observe with the standard insulin.

Sciatica and its Treatment, with Especial Reference to Epidural Injection

By GERALD SLOT, M.D., M.R.C.P., D.P.H.

(Abstracted from the *Medical Press and Circular*, Vol. CXCVI, 5th January, 1938, p 15)

Ætiology

The ætiology of sciatica is by no means well defined. The usual causes of the diseases are allied to those which are often associated with rheumatism, *viz*, focal sepsis, cold, damp, trauma and muscular strain. It is true, however, that there are many cases in which none of these antecedents can be identified, and there are, too, a large number of cases in which the focal sepsis has been removed and yet no amelioration has occurred in the condition. Trauma must play a part, and I am inclined to regard spondylolisthesis as being at times responsible. That this is a factor in some cases is undoubtedly true, and accounts for the cures that have at times been effected by osteopaths in manipulating the spine. Whether this displacement occurs by traction or direct irritation, is difficult to say. The features of cases in which this has occurred are high tenderness, that is, tenderness over the lumbo-sacral spine and the upper part of the gluteal region. The middle part of the leg and the thigh often seem

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to be immune, while the pain is referred to the foot. A convenient classification is that proposed by Professor Roger, *viz*, (1) para-sciatica, referable to an irritative contraction of the roots, *viz*, that part of the root which runs from the dura mater sheath to the plexus, the plexus trunk and branches. Para-sciatica includes the rare symptoms associated with tabes, herpes and syphilitic meningitis. (2) The second group is the symptomatic sciatica connected with infection, and in this group we have had cases in which gonorrhœa, alcohol, gout, and growths, either of the nerve or spinal cord, have given rise to the sciatic syndrome. Injuries such as those caused by falls and blows and direct injury following injections have also been associated with these symptoms. (3) In the third group we have the rheumatic sciaticas, and these can be ætiologically divided into the funicular or high sciatica, sciatica of the sacro-iliac type; here it is the plexus which is chiefly involved; and, lastly, low or neuro-sciatica, where the pain is largely in the leg or foot, and may be confined to the branch of the nerve only. In addition to these findings, there is also sciatica which resembles fibrositis. The important point is the recognition of the causation in sciatica, *viz*, the vertebral element. This factor was further emphasized by Goldthwait, who insisted on the importance of the vertebral and pelvic joints in the ætiology of sciatica, and drew attention to this form of sciatic neuralgia which follows sacralization of the fifth lumbar vertebra, due to the fact that the fifth root of the lumbo-sacral plexus runs between the lumbar and first sacral vertebra in the intervertebral foramen. This root is one of the chief constituents of the sciatic nerve. Rheumatic sciaticas are by far the commonest in my series, and of all the rheumatic sciaticas the lumbo- or high sciatica is the most frequent. These are very frequently associated with an arthritis of the lumbar vertebræ, or of the sacro-iliac joint, and it is only when the *x*-ray is taken that a disease which may not previously have been suspected is revealed. In the high sciatica the onset is sudden; Lasegue's sign or stretching of the leg does not increase it. The peroneal femoral reflex is usually absent. In the middle sciatica the ankle jerk remains, while hypotonia and atrophy of the gluteal muscles are common. In low sciatica the pain rises above the buttocks; the ankle jerks and malleolar reflexes are frequently absent, and the knee jerks are usually present.

Other causes which produce pain are a sacralization of the fifth transverse processes, spina bifida occulta. Extrusion of the intervertebral disc into the spinal cord with compression of the spinal cord and nerve roots caused by any abnormal strain or stress will also set up severe sciatic pain. This condition is extremely difficult to diagnose as the protrusion may occur at any level of the movable part of the spinal column: in the cervical, thoracic, or lumbar regions. Frequently in these cases the neurological examination is negative and an ordinary *x*-ray may only show narrowing of the intervertebral space. The only sure diagnostic measures are fluoroscopic and *x*-ray examinations, after injection of lipiodol into the subarachnoid space, the reversed Queckenstedt test, performed as an epidural injection, is really the best means for diagnosing this condition. In ordinary sciatica the pain is at first exaggerated by the injection, and then, as the anæsthetic spreads, the pain becomes relieved; but where extrusion of the intervertebral disc is present the pain becomes unbearable, and the injection has to be stopped. In such cases surgical intervention in the form of laminectomy is the only satisfactory procedure. The diagnosis of the presence of a protruding disc is not easy; the condition is usually to be suspected in patients who have pain that follows the distribution of one or more spinal nerve roots for a considerable time, and who have not been benefited by the usual conservative forms of treatment. An examination of the cerebrospinal fluid by lumbar puncture reveals a total protein content of more than 40 mg., and there is a positive reaction to the test for globulin. At times these tests may be negative, and the reversed Queckenstedt test gives the real and only clue to the cause of the trouble. For the radiological examination, 5 c.cm. of radio-opaque oil is injected into the subarachnoid space in the lumbar region, and the excursion of the oil is studied on a tilting fluoroscopic table while the patient is in the prone, supine, lateral and oblique positions. As the protruded fragment of the disc is extradural, it pushes against the column of the radio-opaque oil on the vertebral surface, and indents or displaces it posteriorly and sometimes laterally. Complete obstruction of the oil is observed in large protrusions. A protruded disc frequently emerges through the posterior spinal ligament, after which it usually extends on one or both sides of the medial lines and presses on one or both contiguous roots, with a resulting deformity of the oil shadow. The most valuable views for demonstration of these lesions are the antero-posterior and oblique. A complete study of the passage through the entire spinal canal should be made, as more than one lesion may exist. Tumour of the cord may also be present.

In the majority of cases in our series, now well over 200, true sciatica seems to be rare, and most of them fall into the group which one would prefer to call 'the sciatic syndrome'. The pain frequently starts with a severe stab in the back, which is of a violent character, is usually one-sided, especially over the region of the buttocks and the posterior aspect of the thigh, and very often runs down the leg and into the feet. The pain is of a varying character, sometimes dull and aching, and at other times associated with sharp bouts. In objective examination various methods have been adopted: one is the detection of certain local points of tenderness, such as the external malleolus, or the external plantar nerve, and others which have been described by various writers. These points are, however, too varied and too inconsistent to be of value in diagnosis. Another method is to see whether pain occurs on stretching of the nerve, giving rise to the familiar Lasegue sign, in which an attempt is made to straighten the leg on the thigh while the patient is lying in the dorsal position; association of abduction with this movement usually increases the pain. In many of our cases, too, there has been some well-marked scoliosis and it has not always been easy to ascertain whether this has come after the disease or simultaneously with it. Sweating on one side and wasting of either the thigh or leg muscles are also frequent symptoms. Apart from this, physical examination helps little. The reflexes are variable, though usually diminished and sometimes absent. Lumbar puncture reveals no change in the cerebrospinal fluid. We have attempted to classify these cases according to their symptomatology in high and low, according to whether the pain is situated more in the calf or more in the upper thigh or back, but this has not been easy because so often the pain merges one into the other.

In group 2 we find the 'sciatic syndrome'. In these cases an *x*-ray examination may show osteoarthritis of the spine, sacro-iliac joint or hip. More detailed examination will reveal occasionally an enlarged prostate or malignant disease of the sacrum or rectum; while where bilateral sciatica is present the possibility of tabes dorsalis should always be taken into account. Tuberculosis of the sacro-iliac joint has been present in one of our cases, and afforded the clue to a particularly intractable pain.

Therapeutics

Many of the cases in our series had had the usual treatments for sciatica, that is to say, eradication of the septic focus, massage, diathermy, and the more modern short-wave diathermy, various proceedings such as stretching of the nerve, acupuncture, and the usual analgesic drugs, such as aspirin and its various derivatives; and it was only when these had failed that the method we use has been tried. This is founded upon the fact that has been observed, that many cases of sciatica are associated with disease of the sacro-iliac joint. This can be proved in some cases

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by radiological examination, while in other cases radiology shows little change, although the symptoms suggest irritation from this focus; these are: pain on jerking of the spine, tenderness over the sacro-iliac joint, tenderness on rotation. In addition to this, there is the well-established therapeutic knowledge that the stretching of the sciatic nerve in some cases relieves the pain, but not in all. The cases where the pain has not always been relieved have been those in which some scoliosis has been present.

The treatment we have used has been a combination of epidural injection and manipulation under evipan anæsthesia. The advantages claimed by this method are the rapidity of treatment, the simplicity of the technique, and the high percentage of cures obtained in comparison to other methods. The two principles of the treatment are: (1) the stretching of the nerve roots by the harmless fluid, and (2) manipulation. The patient is prepared as follows: He enters hospital either the night before or the same morning, a complete examination, including *x*-rays, having previously been made. First, everything must be prepared; this includes 100 c.cm. of 1 per cent novocaine in sterile normal saline, a lumbar puncture needle, an infiltration syringe which fits the lumbar puncture needle closely (the type I now use is made by Messrs. Vann), evipan, and a syringe for administering this. It is convenient to have the patient lying in the left lateral position. The evipan is given by an assistant, 5–8 c.c. are usually required. Prior to administering the evipan the sacro-coccygeal foramen is identified; this can be done by running the finger down the two sides of the sacral crest, and feeling a depression bounded on the two sides by the tubercles of the sacrum. This can also be identified by running the finger up the coccyx. The needle has first to be introduced at an angle of about 70° to the skin; to enter the canal the direction has to be changed to an angle of about 20° to the sagittal plane. One can feel when the needle is in the right place; 50 to 100 c.c. of warm sterile novocaine are now slowly injected—the dose varies with the size of the patient. As the fluid goes in the resistance is found to increase; the needle is then withdrawn and the puncture sealed with an 'Elastoplast' dressing. Manipulation is now performed. This consists first in the hyperextension of the lumbar spine; the knee is placed in the hollow of the back and both legs firmly and gently pulled against it. The patient is then turned round and the knees straightened, and both legs, one after the other, are forced on the pelvis (the pelvis being fixed by an assistant) so as to stretch the sciatic nerve. It is wise to have the patient in position before the evipan, as this avoids a certain amount of moving about. On recovery, some veganin is prescribed, or, where there is severe pain, omnopon, and it is wise to have some massage the next day. A Transcutan bath is also helpful. In the majority of our cases this has been all that has been necessary, but in 20 per cent of them one treatment has not been sufficient, and a second injection has been required. The majority of the series of over 200 cases have been intractable cases which have resisted the usual methods of treatment.

In cases of osteoarthritis of the hip, of course, the manipulation is practically reduced to a minimum, although I am convinced by experience in many cases of the intractable trouble that a slight manipulation acting with the epidural injection has been most helpful to the patient. This does not apply, of course, to the cases where there has been bony ankylosis. We have been persuaded to do this in osteoarthritis because of their intractable nature, and because of the similarity of their symptoms to some cases of sciatica. While, of course, no cure can be promised in this condition, patients have frequently been very pleased with the great alleviation of pain which has resulted and the treatment can, if necessary, be repeated in six months' time. The average stay in hospital has been one day. Other methods of treatment have been:

(1) *Operative measures.*—Resection of the ilio-tibial band. This operation was described by Ober, but the indications for it are by no means clear. An important diagnostic sign is alleged to be as follows: The patient is placed on one side, the examiner places one hand on the pelvis and grasps the patient's ankle lightly with the other, holding the knee flexed at a right angle. The thigh is abducted and extended to the coronal plane of the body. If contracture is present, the leg still remains abducted.

(2) *Pre-sacral injection* for sciatica has been described by Pendl at the Surgical Congress. Anæsthesia is obtained by pre-sacral injection in the knee-elbow position, about 2 cm. along and right on the tip of the coccyx, parallel to the medial plane and directly in the anterior surface of the coccyx and os sacrum, up to the bone of the sacrum. I have no experience of this method.

The subarachnoid injection of alcohol has been advised for the relief of some of those intractable cases of pain; this seems to be a measure fraught with some risk of permanent nerve damage, and although relief at times is obtained, I have felt that the dangers involved have not justified its use. Where, however, the pain is due to malignant changes in the vertebral column, and other methods have failed, this might be considered. Lipiodol injections have been given epidurally, but I have not seen any advantage of this over the saline therapy.

(3) *Electrotherapeutics.*—Many cases have been treated by this method. Salicylic ionization has been widely used, and at times has been followed by relief of pain, but this method should not be used in the acute stage, or when the skin is inflamed. Dielectrolysis has been described as a successful treatment but the treatment seems to be inadequate, and by no means easy to carry out. Deep *x*-ray therapy has been used, and a fifth of the cases were cured and a fifth improved. The early cases reacted more quickly, but then it is well recognized that early cases of sciatica frequently get well of their own accord.

(4) *Spa treatment.*—The usual spa measures used are: (*a*) hot sulphur water in the form of the swimming bath; (*b*) under-water douches, the patient lying in a bath full of mineral water for five minutes; (*c*) the Aix douche, massage carried out under a stream of water by two attendants. Large jets are applied by a hose which the attendant holds high on his shoulder and applies to the lower limbs of the patient; (*d*) the general Aix douche, which consists of a needle spray in a narrow cabin, a combination of a natural vapour and water massage. Rest is essential after all these treatments as there is sometimes a severe reaction.

Diathermy and short-wave therapy have also been used with success in some cases of sciatica. Stretching and massage is of little value in true sciatica, but is of great value in the fibrositic cellular type.

An operation has been recommended by certain orthopædic surgeons for intractable cases, this consists of fusion of the lumbo-sacral spine, the facets of the lumbo-sacral articulation are exposed and removed, and a Hibb's fusion performed. Following this operation relief of pain has been recorded, and neurological examination later has revealed return of motor and sensory function, but it is clearly a severe operation which should be held in reserve for only the most drastic cases.

Therapeutic Abortion and the Law

(From the *British Medical Journal*, Vol. II, 30th July, 1938, p. 225)

THE true physician's only desire is to do his best for his patient. His problem is often to choose between two evils: the possible ill effects of his treatment, and the probable consequences if he does nothing. The gynæcologist sees many pregnant women who, if they go to term, will probably suffer some harm. This may be slight, or so grave that it will almost certainly cause death. In many of these cases he is convinced that an abortion is in the best interests of the patient. His choice, however, is complicated by the knowledge that

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if he terminates pregnancy he will destroy a potential life, and also that the law forbids abortion in some circumstances. Many doctors have for a long time been anxious to know exactly what the law allowed them and did not allow them to do. They found one answer only. The Offences Against the Person Act, 1861, Section 58, said that a person who 'unlawfully' used an instrument with intent to procure the miscarriage of a woman committed a felony for which he could be punished with penal servitude for life. They asked the meaning of 'unlawfully' and were told that it had never been defined, either by Parliament or by a judge, but that the law almost certainly allowed the termination of pregnancy for the purpose of saving the mother's life. When they discussed the subject among themselves, they found wide variations of opinion on what the law was—apart from much wider variations of opinion on what the law ought to be. They felt anxious and insecure, and a strong movement grew up among them to have the law clarified.

At the same time, a number of lawyers who had paid special attention to the problem were aware that the law was vague, but felt convinced that this very vagueness was a good thing. They realized much better than the doctors the essence of the English legal system: a man may do anything which is not expressly prohibited by law; and where authority is lacking the law is written in the hearts of the people, to be interpreted by the judges. The undefined word 'unlawfully' allowed the authorities to give the medical profession, whom they knew to be with very few exceptions not only responsible but conscientious, a free hand to decide for themselves what was lawful in therapeutic abortion. The lawyers were content, in other words, to assume that an abortion was carried out lawfully when a doctor performed it in good conscience, after careful thought and observation and under proper conditions, for the substantial benefit of the patient. They felt that, so long as the law refrained from saying what a doctor could do, the question of what he could not do need not arise so long as he acted *bona fide*; he could be left outside the sphere of criminal law and practice altogether, and the police could devote their energies to detecting and prosecuting the people against whom the statute was directed—namely, the professional abortionists, lay or medical, about the unlawfulness of whose activities there was no possible doubt. This attitude, however, did not allay the anxiety of medical men, and the situation was resolved last week in an English court of law.

Mr. Aleck Bourne has for some time been among the chief of those who have desired to know clearly where they stood under the law. He is a leading obstetric surgeon with keen clinical and psychological insight. He felt that in some cases, to do his best for his patient, he must perform an abortion. He also felt that the true interpretation of the law must allow abortion where it was in the best interests of the patient, and he formed the resolution to take the first suitable opportunity of having the legal position made clear. In this country a legal ruling can only be obtained in relation to a particular case, whether it be a civil action or a criminal prosecution. He was therefore prepared to take the extreme course of risking his liberty, life's work, and reputation by submitting to a criminal prosecution in which the Crown would differ from him on the interpretation of the word 'unlawfully'. As it happened, when the suitable occasion arose he was barred by a promise of secrecy from actively presenting himself as a sacrifice, and it is understood that the Crown moved on information which he had not supplied. A girl less than fifteen years of age was assaulted by some soldiers and raped under as revolting a set of circumstances as could be imagined. She became pregnant and was taken to see Mr. Bourne, who admitted her to St. Mary's Hospital for observation. He had a strong bias from the beginning in favour of an abortion, but he did not perform it until he had satisfied himself, by tests and observation, that the girl would in all probability, if she had gone to term, have suffered grave and lasting nervous damage which would have expressed itself in psychoneurotic and physical illness perhaps for the whole of her life. Though he acted openly, he did not consult any of his colleagues, his reason being that in such cases he was accustomed to act as the 'second opinion' himself. He was charged under Section 58 of the Act of 1861 with unlawfully using an instrument with intent to cause miscarriage, and the case turned on the interpretation for the first time of the word 'unlawfully'.

The trial took place on 18th and 19th July at the Old Bailey before Mr. Justice Macnaghten, and will long be remembered as one of the most remarkable that has ever taken place, even in the Old Bailey. The accused was treated throughout with admiration and respect; his motives were regarded with what must have been almost unanimous approval. It was less a criminal trial than a co-operative effort by judge, jury, counsel, and witnesses to create law out of strong but ill-defined feeling. The foundation was laid by the judge after the Attorney-General, Sir Donald Somervell, K.C., had closed the Crown case: he defined the word 'unlawfully' by importing a phrase from the Infant Life Preservation Act, 1929. That Act was passed to prevent the killing of a child in the short interval when it is capable of being born alive and therefore comes outside the law of abortion but has not yet acquired an existence independent of that of its mother and therefore cannot in law be murdered. Section 1 of that Act contains a proviso that no person shall be found guilty of the offence of child destruction unless it is proved that the act which caused the death of the child was not done in good faith for the purpose only of preserving the life of the mother. The learned judge held that this proviso expressed what had always been the law in regard to abortion and was implicit in the word 'unlawfully' of the 1861 Act. He therefore ruled that the question for the jury would be: 'Has the prosecution proved to your satisfaction, beyond reasonable doubt, that the act which Mr. Bourne admittedly did was not done in good faith for the purpose only of preserving the life of the mother?'

No one doubted Mr. Bourne's good faith, but he himself admitted that he had not acted to save the girl from immediate death. The next step in the case was therefore to determine the meaning of the phrase 'preserving the life of the mother'. There was no doubt that the girl's health would almost certainly have been gravely injured. In fact, the Attorney-General greatly clarified the case by admitting as much at the end of his closing speech. He said, 'I do not minimize the possible mental effects of which Mr. Bourne and the other doctors spoke. The question is whether those mental effects, grave as they are, justify under the law the termination of pregnancy'. In answering that question the judge used words which will probably be quoted for a long time to come as a statement of the attitude which the law requires of the doctor who performs a therapeutic abortion. He said, in effect, that no line can be drawn between danger to life and danger to health; that no doctor knows whether life is in danger until the patient is dead; and that if on reasonable grounds, based on adequate knowledge, after consultation with colleagues, a doctor forms the opinion that the probable consequences of the continuance of pregnancy would make the woman a physical or a mental wreck, then he is not only entitled, but it is his duty, to perform an abortion. In saying this his Lordship was—most fortunately—saying that the law and the physician's duty are in harmony. To preserve a woman's life, he implied, is not merely to save her from death; it is also to save her from illness which would destroy so much of her life that it would hardly be worth living. With this view the jury agreed, as is shown by their verdict, and it is now the declared law until it is corrected or modified by the Court of Criminal Appeal in some other case.

The trial Rex *v.* Bourne has therefore ventilated the whole subject of therapeutic abortion and produced a statement of the law which substantially allows the conscientious medical man to do what he has been doing already. But the law, hitherto vague, has now

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been clarified, and after the Ministry of Health's Inter-Departmental Committee on Abortion (the Birkett Committee) has issued its report it may be clarified still more.

Treatment of Narcotics Addiction

'Fallacy of cures'

(Abstracted from the *Annual Report, Central Narcotics Intelligence Bureau, Egyptian Government*, 1937, p. 85)

In the Annual Report for 1931 of the Central Narcotics Intelligence Bureau a note on treatment for narcotics addiction by the assistant director of this bureau drew attention to the danger of so-called 'cures' which were, in fact, not cures at all but merely temporary de-narcotization of basically unstable and abnormal persons. Figures from a report made by the Mayor of New York in 1930 by seven professional doctors together with their observations and deductions were quoted to show that there is no evidence to confirm claims for any such thing as a 'cure' or a 'specific' for drug addiction.

The intervening years have produced no challenge to this conclusion: on the contrary it has everywhere been supported and confirmed by professional medical men as opposed to 'quacks' who have specialized in the treatment of drug addicts and addiction.

The latest confirmation is to be found in the Annual Report for 1936 on Traffic in Opium and Other Dangerous Drugs published by the Bureau of Narcotics of the United States of America Treasury Department.

The Narcotics Educational Association of Michigan, which sponsors and controls a farm for the treatment of drug addicts, makes the following remarks:—

'It is our present opinion—after years of close observation—that in the main no one becomes addicted to narcotic drugs except only those who may be best described as "emotionally unstable and personally inadequate" and that, with very few exceptions, those who are "emotionally stable" have very little to fear in the way of drug addiction.

In other words, in a vast majority of instances drugs such as morphine are the means of escape from the realities of life indulged by unstable persons really wishing to escape those very realities. This is true of essentially all those who appealed to the association for help.

An employment bureau and probationary follow-up department was theoretically designed to provide after-cure care for returned patients, whose "habit" had been broken at the association farm. But it did not take into consideration what then was presumably unknown, *i.e.*, that the returned patient, though "cured" of his addiction, was still emotionally unstable and personally inadequate, and certain to remain so. He may have given every evidence of a favourable reaction while in the favourable environment of a farm, but found himself utterly incapable of successfully coping with the unfavourable environment of our urban centres.

The use of the word "cure" is highly erroneous and improper in that no cure—in the commonly accepted sense of the word—is known to medical science. That is, no "medicine" is known which will "cure" one addicted to the use of narcotic drugs without his consent or against his will.

It would appear that during all these years the directors of the association had suffered from one grand delusion, *i.e.*, that drug addicts were "ordinary folks like themselves" who had become addicted. And, if only they could be "cured" of that addiction, they might again resume the status of useful citizens. The fact remains that at least a considerable, though unknown, percentage of all drug addicts are not "like other folks" but rather are members of an emotionally unstable and personally inadequate group for whom little of permanent character or of social value can be accomplished.

One director, who has served on the board a great many years, states emphatically "that he does not recall one single instance in which a returned cured patient who visited our meetings remained a cured patient". Those addicts who, a committee of physicians have determined, have not rehabilitated successfully at the termination of their convalescent adjustment period, should be promptly transferred into a colonization period. Colonization should be indeterminate, not less than three years, and may be for life.'

In addition to the above, the State Narcotics Hospital at Spadra in the State of California furnishes details and figures of eight years' operation in the care and treatment of drug addicts, thereby enabling a special committee set up by the State Senate to report as follows:—

'California was the first State to build and operate a hospital for narcotic addicts, and there were no records available of the experience of the few private and municipal institutions of that sort. Governor Young said: "I regard this as a test-tube experiment, we can later modify or expand it".

Now, after eight years of operation, we at last understand the problem before us, and we know what we must do to solve it.

We have discarded and washed our hands of the incurable addicts who have recurred to the use of narcotics after the most thorough, painstaking course of treatment known to medical science. These incurable addicts are at liberty on the streets of our cities, spreading drug addiction among their associates and most of them following criminal pursuits in order to obtain the 4 or 5 dollars they must spend daily for their supply of narcotics.

We must provide, in addition to our hospitalization facilities at Spadra, a farm for incurables, where recurred addicts may be committed for an indeterminate period of from 5 to 15 years, at the discretion of the medical superintendent.

We know that two or three years is too short a time to ameliorate the injury wrought in the character of the addict by his addiction. It may be that the period of 5 or 10 years is not enough. We do not yet know the answer, but we do see very clearly that the 5-to-10-to-15 year commitment for the recurred addict is the only possible solution. This plan should succeed unless the disintegration of character is irreparable. In that case we know that the cost of segregating these incurables on a narcotic farm for a very long period will prove much cheaper than permitting them to enslave and degrade others and provide a lucrative market for international narcotic smugglers and our American illicit traffickers.

We must not make a retreat in our warfare against the spread of drug addiction. We must continue to advance and to defend our State against the invasion of a subtle and sinister army of destruction. The Senate Interim Narcotic Committee will introduce a bill at the next session of the legislature providing for the creation of a farm for the segregation of recurred, incurable addicts for an indeterminate period of 5 to 15 years.

To the objection that the solution of the problem of drug addiction will be an added burden upon the taxpayers, we reply that the direct and indirect cost of crime resulting from drug addiction at present is much heavier than would be the cost of segregating incurable addicts on a narcotic farm for a long period of time.

Drug addiction is seldom cured after incipient stages. Various theories have been advanced on this subject: many persons have claimed that drug addiction is incurable; others contend that it is merely a disease for which a remedy will be found; panaceas have been tried and have invariably failed.

During the past eight years of experimentation at Spadra your narcotic committee has refused to accept or promulgate any conclusions. Now however, in view of the records of our narcotic hospital, supplemented by our knowledge of statistics gathered by Dr. Somel

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To, of the Health Commission of Formosa, we must set down our inescapable conclusion.

Drug addiction, defined as addiction to the derivatives of opium, is permanently curable in its early stages and in very rare cases in its later stages.

Our conclusion that drug addiction is progressive, destroying character as it advances, is based upon convincing evidence during the period of 12 years. The point at which it passes from the curable to the incurable stages depends upon the conditions of heredity, character, intelligence, and environment as mentioned before. These cannot be translated into an arbitrary period of time, but we are convinced that the victim usually becomes incurable early in his addiction history.

Judges have asked proof that an addict endangers public morals, health, safety, and welfare. A great authority, Dr. Musgrove, said: "A drug addict is ten times as dangerous and ten times as contagious as a leper—contagious not through physical contact but through mental contact and association".

Our narcotic officials estimate that approximately 80 per cent of our California addicts become criminals, either because of their abnormal personality or to satisfy their craving for the drug.

The Value of Lactic Acid Milk as a Routine Feed for Infants

By WILFRID F. GAISFORD, M.D. (Lond.), M.R.C.P.

(Abstracted from the *Medical Press and Circular*, Vol. CXCVI, 27th April, 1938, p. 362)

'Schools of thought' are common in all branches of medicine, and exist and have existed for generations in infant feeding no less than in pathology.

There have been many systems and methods devised in the modification of cow's milk to adapt it to the human infant's requirements, and each has had its own select group of followers, one following the dilute milk school, another the citrated milk school, another the dried milk, another the humanized milk, and so on.

Some exist for a while and then fall into oblivion, others persist to a greater or less extent but none has yet appeared to be universally acceptable as an alternative to breast feeding.

It has for years been generally taught that there is no 'golden rule' for successful infant feeding and that every baby is different in his reactions and that what will cause one to thrive will cause another to become marasmic—in short, that each individual baby must be tried out till a satisfactory form of feeding be found for him.

Yet the rational and successful feeding of infants is one of the simplest things in medicine. It is possible to feed all babies on the same simple formula just as any baby can be fed successfully on breast milk from any source, *i.e.*, his own mother or a wet nurse, although it is well known that breast milks vary greatly in composition.

Until quite recently babies who could not be breast fed had a comparatively poor chance of surviving any serious illness, especially gastro-enteritis, and artificially-fed babies were always accounted more delicate and difficult to rear than breast-fed ones.

It has been postulated that any normal infant could be fed successfully on a formula which complied with the following requirements: firstly, to supply 1½ ounces of cow's milk per pound of expected body-weight per day, with an additional three ounces of sugar to each quart of milk; secondly, to supply adequate quantities of vitamins A, C and D; and thirdly, that the whole formula should be free from harmful bacteria and should be digestible in the quantities given.

It has been taught that any infant fed on such a formula who did not thrive was suffering either from an infection (such as a pyelocystitis or otitis) or from a congenital anomaly (such as a congenital heart lesion or pyloric stenosis).

Considering these requisites more closely the most noteworthy point in the first is the word 'expected'. This involves the use of a weight-age table which may be taken roughly as follows:—

Expected	weight	at	1	month	is 8½ lb.
"	"	"	2	months	" 10 "
"	"	"	3	"	" 12 "
"	"	"	4	"	" 13½ "
"	"	"	5	"	" 15 "
"	"	"	6	"	" 16 "

For example, a two-month baby should receive 15 oz. of cow's milk per day, plus 1½ oz. of sugar irrespective of his actual weight. This point about feeding according to the expected weight is an important one and one that is often overlooked. The marasmic infant of three months who weighs only 7 lb. has approximately as many cells in his body requiring nourishment as the normal healthy 12-lb. baby of the same age. If he is given only 10½ oz. of cow's milk per day he will not gain, but when he receives 18 oz. he should gain rapidly till he reaches his expected weight.

The next point is the additional carbohydrate—three ounces to each quart of milk. This quantity has been found by experience to be both the maximum and at the same time the optimum amount to add. It is best given as a mixture of carbohydrates, for then there is less chance of excessive fermentation and consequent diarrhœa. The ordinary commercial glucose (a colourless treacly fluid) or Karo corn syrup is most satisfactory. Both of these consist of a mixture of dextrose, maltose, saccharose and dextrin in varying proportions.

The need for additional vitamins in artificially-fed infants' diets is now well recognized and there is a wide selection on the market. Provided 2,000 units of vitamin A and 500 units of vitamin D are given daily it does not matter what particular product is used. Orange juice or tomato juice supplies the necessary vitamin C.

With regard to the third requirement, cleanliness and digestibility. The former is a self-evident one and can be met by careful preparation of the milk and of the feeding utensils. The latter is the most important of all. At the outset it must be realized that cow's milk can never be made the same as breast milk, no matter how it be 'humanized' or otherwise modified. The total percentage of proteins, fats, sugar, and even the salts can be made similar, but the essential differences between the two types of proteins (and their constituent amino-acids) and the fats remain.

Some babies will take whole-milk feeds from birth or from a few weeks old, but not many. Dilution of the milk is necessary in most cases until at least three months of age.

If, however, the milk be first acidified then it immediately becomes digestible, even when given undiluted to a premature baby. What are the effects of acidification which so enable whole milk to be fed to any infant? Briefly they are as follows: The salts in milk act as buffer substances and tend to neutralize the acidity of the gastric juice. Cow's milk contains 0.75 per cent of salts while breast milk contains only 0.25 per cent. The pH of the gastric contents at the height of digestion is about 3.6 with breast milk, and about 5.3 with cow's milk. Acidification of cow's milk results in the neutralization of these buffer substances so that the pH of the gastric contents approximates to that obtained with breast milk.

Such a pH inhibits bacterial growth and assists the normal functioning of the pyloric sphincter. Further. it stimulates the flow of bile and of the pancreatic and intestinal juices, and digestion generally is 'speeded up'.

Acidification precipitates the casein curds of cow's milk in the form of fine floccules so that the gastric juices have much freer access and no bacteria can become enmeshed in the centre of a large curd (as may occur with sweet milk feeding) with the subsequent release of the bacteria lower down in the bowel and the possible onset of an infective enteritis.

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The absorption of mineral salts, especially calcium, is enhanced by the acidification of the upper part of the small intestine and the quick breaking down of the acid renders the lower gut alkaline and furthers the production of a normal intestinal flora.

Acidified milk is a poor culture medium for bacteria and will keep well, even in hot weather.

Finally, because the acidification renders the digestibility equal to that of breast milk, there is no need to use anything but whole milk; consequently the feeds are easier to make up, they have a higher caloric value, and therefore there is less likelihood of underfeeding. Smaller volume feeds are required, with less gastric distention, lessened liability to vomiting and, because of the high caloric value, there is seldom any necessity to feed at less than four-hourly intervals even with small underweight babies.

Lactic acid is chiefly used as the acidifying agent, being added in the proportion of half drachm to the pint of milk.

There is, however, quite wide choice of acids, and any of the following may be used:—

Lemon juice	.. 3 drachms	to the pint
Orange juice	.. 1 ounce	„ „ „
Acetic acid	.. 1 drachm	„ „ „
Citric acid	.. 2 grammes	„ „ „
Hydrochloric acid	.. 4 oz. N/10 HCl	„ „ „

None of these has any advantage over lactic acid.

If preferred, bacterially cultured milk may be used. Streptococcus acidi lactici, Bacillus bulgaricus and Bacillus acidophilus are equally good, especially when the milk is homogenized before being inoculated.

Using lactic acid, the standard formula is prepared as follows:—

B. P. lactic acid, one drachm for each quart of milk (or two drops to the ounce if the feeds are made up individually). The acid is first diluted with water (about one ounce of water for one drachm of acid) and then added slowly to the milk, *which must be cold*, the mixture being stirred continuously. With the addition of the last few drops of acid the milk will become finely and uniformly curdled. The sugar is then added in the proportion of three ounces to the quart and the mixture heated to body temperature before being offered to the infant. It is important not to heat the mixture too much or the curds will conglomerate and the feed will not flow through the teat.

In using this acidified formula it is essential that the hole in the teat be enlarged sufficiently to allow free passage to the fine curds. (Enlargement is easily carried out with a red-hot needle.) During the feeding the bottle must be shaken at intervals to ensure an even suspension of the curds and prevent blocking of the teat.

As has been said, the feeding interval will normally be four-hourly, with four or five feeds in the 24 hours according to circumstances. The quantity necessary will be determined by the infant's expected weight. The customary allowance is 50 calories per pound of such expected weight, and the formula here described yields 30 calories per ounce. Thus for a three-month baby, who should weigh 12 lb., 12×50 or 600 calories are necessary per day. These will be provided by 20 ounces of the formula, which may be given in five feeds of 4 oz., or four feeds of 5 oz., according to the infant's size.

Dried or evaporated milk may be used equally well as the basis of the formula, and acidified after reconstitution with the required quantity of water. The use of dried milk has the advantage of enabling the percentage of solid matter in the feed to be increased (by using more powder), thus increasing the caloric intake without adding to the volume of the feed; often a very useful procedure in feeding premature infants.

The complete formula is also available in dried form under the designation 'Modified Lacidac', which has been in use as a most satisfactory routine feed in hospital and private practice during the last nine years.

Summary

Whole milk acidified with lactic acid and with 10 per cent glucose added is a most satisfactory routine feed for babies. It is especially valuable for underweight and marasmic babies and for premature infants.

Details of the preparation of the formula are given.

Apart from a very small percentage of cases (considerably less than 1 per cent) in whom lactic acid milk causes vomiting, and who are found on investigation to have an unusually high gastric acidity, the dictum that any infant fed on this formula who does not thrive is suffering either from an infection or from a congenital anomaly has been fully borne out.

Reviews

THE BRITISH ENCYCLOPÆDIA OF MEDICAL PRACTICE.—Under the General Editorship of Sir Humphry Rolleston, Bt., G.C.V.O., K.C.B., M.D., D.Sc., D.C.L., LL.D. 1938. Butterworth and Company, Limited, London. (To be completed in 11 volumes.) Sold in complete sets only. Cash price, Rs. 25 per volume. Also available on the instalment system at Rs. 10 per month. Price, Rs. 26-8 per volume. Only available from Messrs. Butterworth and Company (India), Limited, Calcutta. Volume IV. Pp. xxiii plus 600 plus 50

This volume commences with 'diarrhœa' and concludes with 'endoscopy of the rectum'.

There is a general article on diarrhœa by Sir Arthur Hurst, and two shorter chapters, on flagellate diarrhœa and on hill diarrhœa, by Dr. N. Hamilton Fairley. Dr. Fairley takes the view that the pathogenicity of the flagellates is unproven; for the treatment of giardia infection he emphasizes the high protein diet, but he also mentions the rather dangerous procedure of de Rivas, lavage with hot glycerine and magnesium carbonate solution; in fact the impression gained is that he is not writing with the authority of personal experience. (The omission of any mention of atebrin is natural, as attention has only recently been called to its action on flagellate infections.) On the other hand in his chapter on hill diarrhœa he seems to be writing with more assurance, though he is on difficult ground on account of the extreme uncertainty regarding the ætiology of this clinical entity. There is a fourth chapter, devoted to diarrhœa in infancy and childhood, by Dr. W. B. Ellis.

The chapter on epidemic dropsy is contributed by Colonel R. N. Chopra. He gives a concise but very complete account of this disease, so important to the people of the eastern half of this peninsula. It is the inclusion of authoritative articles of this kind that place this encyclopædia in a class by itself as a standard book of reference for the worker in the tropics.

The chapter on bacillary dysentery is by two workers with wide experience in tropical medicine, though mostly in a different field, Major-General H. Marrian Perry and Lieutenant-Colonel A. G. Biggam. The chapter is an excellent one, but, if we have a criticism, it is that, for a book of this kind, they have taken up too much space in discussions on bacteriology, including bacteriological technique, and have even gone as far as outlining the method of preparation of anti-dysenteric serum. Their short reference to bacteriophage in treatment is guarded, to the extent of being definitely discouraging. They say there is no acceptable statistical evidence of its value.

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Other important and interesting chapters in the volume are on dietetic deficiency diseases by Dr. Helen Mackay, eczema by Dr. Arthur Whitfield, electro-diagnosis by Dr. E. P. Cumberbatch, and ear diseases by Mr. Lionel Colledge.

The same high standard of authoritative writing is evident throughout this volume.

THE NEW INTERNATIONAL CLINICS.—Edited by G. M. Piersol, M.D. Volume I. New Series 1. (Old 48th.) 1938. (Published quarterly.) J. B. Lippincott Company, Philadelphia and New York. Pp. iv plus 322. Illustrated. Price, 50s. for four volumes. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. The annual subscriptions to the series (issued quarterly) is Rs. 33-8

We are pleased to see the reappearance of these quarterly International Clinics. Many useful and important contributions have appeared in this series, the format of which is very convenient for the personal or institution medical library.

The first number contains some useful articles on a variety of subjects, for example, the treatment of wounds, vitamin-A deficiencies in adults, pneumothorax in the treatment of tuberculosis, newer interpretations of gastric mucosal functions, skin diseases from an emotional standpoint, normal blood pressure, and intestinal obstruction. There are a few 'clinics', that is to say articles written around illustrative cases, which are very instructive from a practical point of view. Finally, there is a 'review of medical progress', the subject chosen being 'Biliary stasis and decompression'.

The writer of the article on gastric mucosal function is obviously very much intrigued by Greenspon's theory of the ætiology of pernicious anæmia, but, either the paper was written some time ago, or he is unaware of recent work in which it has been shown that some of the experiments on which this theory rested could not be repeated by other observers. The same writer uses the word 'hypothecate' in the meaning 'to frame a hypothesis'. We are a long-suffering race and allow those who have the privilege of using our language to take appalling liberties with it, but the line must be drawn somewhere. The word 'hypothecate' has an entirely different meaning, namely 'to pledge or mortgage' (the 't' is silent, *please*, Doctor Morrison), which it had before Queen Ann came to the throne of England, when Maryland was a not very flourishing English settlement, Baltimore was the name of a noble English family, and grass grew where the town of Baltimore stands to-day, and it has retained the same meaning ever since. The word 'hypothesize', meaning 'to frame a hypothesis', has been in the English language for more than 200 years.

There is one contribution which the reviewer considers might well have been omitted, 'Treatment of amebic dysentery by means of intracolonic heat, by Dr. Damaso de Rivas'. In the interests of our cerebral arteries, we will control ourselves and simply say that it is well below the high standard of the majority of the articles in this useful series.

TEXTBOOK OF NUTRITION.—By J. A. Nixon, C.M.G., M.D., F.R.C.P., and D. G. C. Nixon, M.B., B.S., M.R.C.S., L.R.C.P. 1938. Oxford University Press, London and New York. Pp. xi plus 219. Illustrated. Price, 7s. 6d. Obtainable from Oxford University Press, Bombay and Calcutta

'Nutrition' is very much to the front in medical practice at present, and we have been given a very large number of books on the subject during the last few years. The authors of the book under review consider that an apology is necessary for adding to their number. Though the apology is not very convincing, we consider that the book has certainly justified itself, which is a far more important point.

The book is written primarily for the medical student and practitioner, but it should prove useful to the sanitarian, the non-medical dietitian, and the social worker. Emphasis is laid on the physiological, clinical and economic aspects, and the chemical aspects of the subject are purposely neglected.

The subjects dealt with are the physiology of digestion and metabolism, assessment of the state of nutrition including height and weight tables, food requirements, the choice of foods including very adequate food tables, diet and income, diet in relation to disease production, disease prevention, infection, work and physical efficiency, nutrition in disease and in lactation, and the effects of cooking.

We have a few minor criticisms to offer. The sentence 'In pernicious anæmia liver or a preparation of hog's stomach is an indispensable item in dietetic treatment. Recent observations indicate that liver extract is more potent if injected' is to say the least of it somewhat naive, in the year 1938. In places, the authors' arithmetical sense appears to be distinctly shaky, *e.g.*, they say that one quart of milk contains 160 grammes of protein; they possibly mean 160 calories derived from protein.

In their chapter on diet and disease production, they are very emphatic about the complete lack of evidence for the statement that meat-eating causes cancer. It is a most interesting study in mass suggestion; the assertion that meat causes cancer is made so frequently by food faddists and other cranks, usually accompanied by blatant misstatements, such as, 'as is universally recognized' or 'as has been proved' that a large number of people really believe that some association between meat-eating and cancer has been scientifically proven.

We consider that the book is a valuable addition to the medical literature of nutrition, and is one that will meet the requirements of the practitioner admirably, providing him with a well-balanced introduction to the study of nutrition and a ready reference book for looking up important facts and figures that no one can hope to, or should attempt to, memorize.

L. E. N.

ADVANCES IN THE THERAPEUTICS OF ANTIMONY.—By Prof. Dr. Phil., Nat., Hans. Schmidt, and Dr. Med. F. M. Peter. 1938. Georg Thieme, Publishers, Leipzig. Pp. x plus 257, with 10 diagrams. Price, RM. 18

Antimony has earned for itself a unique place in the history of therapeutics. It has always managed, to use a modern expression, to get 'into the news', and has displayed an unusual ability to stir human passions; it has been lauded to the skies as a cure for all ills, and it has been banned by parliamentary edict; it has saved the lives of hundreds of thousands, and has been a favourite medium of the murderer; it has brightened the eyes of Jebezel, and it has helped to empty the stomach of a surfeited Nero. It has also made a complete slave of one of the world's great chemists, Professor Hans Schmidt, but it can with equal truth be said that it has been completely mastered by him. For many years Professor Schmidt has lived and thought of nothing but antimony; in his home he is surrounded by antimony in the hundreds of forms in which it occurs in nature, and in his laboratory he has toiled day and night, like the alchemists of olden times in their search for the elixir of life, to find the most perfect preparation of antimony, so that to-day the shelves around his laboratory walls are lined with hundreds of different chemical combinations of this element.

Unlike those of the alchemists of old, Professor Schmidt's efforts have been crowned with success and he has prepared antimony compounds that can be tolerated by the human organism in doses that a few years ago would be considered unbelievably large, and yet that have a parasiticidal power many times greater than the old pharmacopœial preparations. The greatest successes of antimony have been in protozoal and helminth infections of man and animals, in leishmaniasis, bilharziasis, and trypanosomiasis, but in many other conditions, *e.g.*, granuloma venereum, it has proved of undoubted therapeutic value.

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The present volume is not a chemical treatise but a record of the successes and the therapeutic limitations of antimony in its multifarious forms.

The largest section of the book is entitled 'Clinical experience in human medicine', other sections are 'Clinical experience in veterinary medicine', 'Tests in experimental infections', 'On the synthesis of antimony preparations', and 'Pharmacology'.

The book was published in German last year. This English edition is very welcome; it is an important contribution to general therapeutics, but more especially to therapeutics in the tropics.

L. E. N.

A TEXTBOOK OF HISTOLOGY.—By A. A. Maximow and W. Bloom. Third Edition. 1938. W. B. Saunders Company, Philadelphia and London. Pp. xv plus 668, with 542 illustrations. Some in colour. Price, 30s.

Professor Maximow's is a name that will figure in the histological textbooks of many generations as that of a man who was responsible for some of the most important advances in the closely allied sciences of cytology and histology during the first quarter of the present century; that he died before completing his textbook on histology will be considered by many nothing short of a tragedy. However, the book which Dr. William Bloom has produced from Professor Maximow's material is, in the reviewer's opinion, quite the best textbook available to-day. That this opinion is not unique is suggested by the fact this textbook is now in its third edition.

The first point on which we should congratulate the present author is that the bulk of the book has been increased only by a negligible number—six to be exact—of pages. This is a great achievement, more especially as, we are informed in the preface, 42 new text-figures have been added.

We have not compared the present and the last edition section by section, but in most chapters there has been considerable revision and references made to important new work. For example, in the chapter on the spleen Taliaferro's work on monkey plasmodium infection has been utilized to explain the functions of the spleen and some of his illustrations included.

In the chapter on the blood forming and destroying tissues there is a good coloured plate of cells from a stained smear made from human bone marrow, which include the pathological megaloblasts seen in pernicious anæmia.

It only remains for the reviewer to repeat his opinion that this is the best textbook of histology available to-day.

MALARIA IN CEYLON: AN ENQUIRY INTO ITS CAUSES—THE THERAPEUTICS AND OTHER MEASURES USED DURING THE EPIDEMIC OF 1934-35, WITH RECOMMENDATIONS FOR THE PREVENTION OF FUTURE EPIDEMICS.—By C. L. Dunn, C.I.E., D.P.H. 1937. Baillière, Tindall and Cox, London. Pp. vi plus 57, with 4 maps and 5 graphs. Price, 6s.

The epidemic of malaria that occurred in Ceylon in 1934-35 was one of the most widespread and devastating outbreaks of recent times. This epidemic affected nearly 2 million people and collected a toll of over 100,000 lives. It cost the Government over 5 million rupees and in addition the strain of organizing one of the biggest campaigns for the treatment and cure of the sick.

Colonel Dunn who had an opportunity to visit the island at the time of the epidemic and to study first hand the conditions prevailing there has set forth his observations in this excellent report. He has discussed the history of malaria in the island, its physiography and climatology, the causes of the present epidemic and the therapeutic and other measures used for controlling it, in a clear and lucid manner. He has himself collected a vast amount of data which he has analysed. The significance and value of his data are enormous. His section on the therapeutics of malaria is worthy of special mention. On the whole this is a valuable contribution and ought to be read by everyone interested in malaria. It gives an insight into the ways and means that ought to be adopted for controlling malaria when it breaks out on an extensive scale.

K. V. K.

TEN MILLION AMERICANS HAVE IT.—By S. W. Becker, M.S., M.D. 1937. J. B. Lippincott Company, Philadelphia and London. Pp. 220. Price, 6s. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 4-8

This is a book on syphilis meant for the use of the general public. It narrates in a vivid and interesting way, and in simple non-technical language, the ravages caused by the disease in America. It forms part of a campaign that has recently been started in that country for educating the people on the dangers of the disease and for inducing sufferers to resort to treatment early.

In the book special stress is laid on the necessity for considering this disease as in no way different from any of the other infectious diseases. This indeed is the correct view and should be accepted. There is no meaning in considering venereal diseases as a just punishment for the sin committed. An enormous amount of harm has been done already in the past by branding these diseases as a mark of an immoral person and that attitude has indirectly forced the sufferers to hide their disease as far as possible and to resort to secret and inefficient treatment by quacks; this has also encouraged the wide dissemination of infection.

Although the disease is mostly contracted by a voluntary act on the part of the adult individual that is no reason why the state and the public should look down upon an infected person and shirk helping him to get rid of his trouble. Both the public and the state must admit that they owe a duty to the healthy; if so by neglecting the sufferers they are failing in their duty to the healthy. It is high time therefore that the present attitude of the public towards syphilis and the venereal diseases was changed and the sufferers treated in a sympathetic and humane manner.

Every facility should be provided for the diagnosis and cure of the disease at public expense. Only by adopting such a course will this disease be stamped out from our midst. The book on account of its championing the above views is worth reading. Syphilis is as much a problem in India as in the West. The indifference and apathy shown to the control of this disease in India is regrettable. What is stated to be the need in America is also true of India. Therefore the book is specially recommended for study by the general public in India.

K. V. K.

SYPHILIS AND ITS TREATMENT.—By W. A. Hinton, M.D. (Boston). 1936. Henry Kimpton, London. Pp. xvi plus 321. Price, 15s.

In this book Dr. Hinton has set forth his experience gained in the laboratory and in the clinics at Boston. The book consists of 321 pages and gives a fairly detailed account of the clinical, laboratory and therapeutic aspects of syphilis. Although there are many books written on syphilis this is certainly a valuable addition to them. Most American books are full of illustrations. In this one illustrations are conspicuous by their absence and yet the book will be found useful by students and practitioners.

K. V. K.

MUIR AND RITCHIE'S MANUAL OF BACTERIOLOGY.—Revised by Carl H. Browning, M.D., LL.D., D.P.H., F.R.S., and Thomas J. Mackie, M.D., D.P.H. Tenth Edition. 1937. Oxford University Press, London. Humphrey Milford. Pp. x plus 996. Illustrated with 212 illustrations in the text and 6 coloured plates. Price, 20s. Obtainable from Oxford University Press, Bombay and Calcutta

On the retirement of Sir Robert Muir from participation in the revision, the original authorship of this well-known textbook of bacteriology has come to an end. For more than forty years 'Muir and Ritchie' has

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been recognized as one of the standard books on bacteriology and has been used widely, both by medical students and post-graduate workers. The present edition has been thoroughly revised and brought up to date. New knowledge and new methods of investigation have been incorporated, and many of the illustrations have been replaced by photomicrographs. The tenth edition of this well-known book fully maintains the high reputation of its predecessors and we have no doubt it will be as popular with medical students as the previous editions.

C. L. P.

NOTES ON BACTERIOLOGY AND CLINICAL PATHOLOGY FOR NURSES.—By Herbert Rogers, M.D., Ch.B. (Bristol). 1938. H. K. Lewis and Company, Limited, London. Pp. vii plus 40. Price, 1s.

This little book has been written to assist nurses preparing for the examinations required by the General Nursing Council and to create an interest in the pathological investigations carried out on their patients. The first half of the book consisting of 16 pages is devoted to the classification and the study of bacteria, fungi, protozoa, and animal parasites, and the second half to clinical pathology and the methods of collection of pathological specimens. The author has succeeded remarkably well in giving a simple and a clear account of the nature of bacteria and other human parasites, a study of which will help the nurse to understand the meaning of the various laboratory investigations carried out on patients and will lead to an intelligent co-operation between the wards and the laboratory.

C. L. P.

AIDS TO BACTERIOLOGY.—By W. Partridge, F.I.C. Revised by H. W. Scott Wilson, B.Sc., B.M., B.Ch. (Oxon.). Sixth Edition. 1938. Baillière, Tindall and Cox, London. Pp. vii. Plus 300. Price, 5s.

The sixth edition of this well-known member of the Aids Series has been thoroughly revised. The classification, as recommended by the Society of American Bacteriologists in a slightly modified form and which has been generally accepted by the majority of English bacteriologists, is used throughout this edition. This is a distinct advantage as it must lead to a uniformity in nomenclature and a clearer understanding of different genera. It is regrettable, however, that in the adoption of the new nomenclature the abbreviations used for the genus Bacterium and the genus Bacillus have not been differentiated and in the abbreviated form stress is not laid on the great differences between these two genera.

This book is of immense value to the student not only for revision purposes, but it will help him in the understanding of the subject when it is used in conjunction with one of the larger textbooks and with his lecture notes There is a remarkably large amount of information including the important recent contributions to bacteriology in a readily accessible form, which will be of interest and value to the medical practitioner and also to the medical bacteriologist who desires to refresh his memory on any particular subject.

C. L. P.

A SYNOPSIS OF PHYSIOLOGY.—By A. Rendle Short, B.Sc., M.D., F.R.C.S., and C. L. G. Pratt, M.A. (Educ.), M.Sc., M.D. Third Edition. 1938. John Wright and Sons Limited, Bristol. Pp. 325. Illustrated. Price, 10s. 6d.

This small book is an admirable collection of up-to-date information on physiology. The chapter on chemistry will be of great help to students. The subject-matter is well written and not monotonous to read. It is a very suitable book for students for quick revision before their examinations. It will also be a useful book to practitioners for quick survey of the subject. It is trusted that the book will meet an eager demand.

P. D.

THE AMERICAN ILLUSTRATED MEDICAL DICTIONARY.—By W. A. Newman Dorland, A.M., M.D., F.A.C.S., Lieut.-Col., M.R.C., U. S. Army. Eighteenth Edition. 1938. W. B. Saunders Company, Philadelphia and London. Pp. 1607. Illustrated. Price, 30s. (plain). 32s. 6d. with thumb index

It is perhaps not quite the right place to raise this protest, but why is it that no British publishing house will undertake to give us an English medical dictionary? America is supplied with some excellent ones of which the book under review is one of the best examples. The compilers have gone a long way towards meeting the wants of the British reader and in most instances have given the alternative English spelling, but why should the British reader, for words beginning *hæmato-*, have to *see* those beginning *hemato-* . It makes it an up-hill fight for editors in the Empire, outside Great Britain, to maintain correct English spelling in their journals.

It is three years since the last edition appeared. It is an alarming thought that it has been necessary to add definitions of 3,000 new words, and that as a result the text has had to be increased by sixty pages. However, the words have been brought into use and we must be able to look them up when we meet them for the first time. A little saving of space has been made by contracting the posological tables without limiting their usefulness.

'To be of permanent value a medical dictionary must cover modern literature and this calls for frequent and constant revision. The editor believes that in this new and enlarged edition the *American Illustrated Medical Dictionary* will continue to prove its usefulness to practitioners and students.' We are quite sure that it will, and can unhesitatingly recommend it.

A GUIDE TO ANATOMY: FOR STUDENTS OF MEDICAL GYMNASTICS, MASSAGE AND MEDICAL ELECTRICITY.—By E. D. Ewart. Fourth Edition. 1938. H. K. Lewis and Company, Limited, London. Pp. xii plus 342, with 102 illustrations including 39 plates. Price, 12s. 6d.

This little volume is intended to serve the needs of students of medical gymnastics and massage, and as such is a guide to anatomy in a restricted sense. The book consists essentially of two broad divisions, *e.g.* (*a*) osteology (section i); (*b*) soft structures (sections ii, iii, iv and v) with an introductory section before each division giving, in a brief outline, the fundamentals of the nature of structures to be described in the following chapter or chapters.

The author has constantly kept in view the needs of his special class of students and consequently laid stress upon those structures which are directly concerned with this special mode of treatment. The subject-matter has accordingly been arranged in order of importance, *viz*, bones, articulations, muscles, and then nerves and vessels.

In this brief account, every part of human anatomy has been included but unfortunately old terminology has been used. One would wish that the muscles and nerves were more elaborately illustrated, not only for the purpose of examinations but also for subsequent professional utility. Thus, muscles of the foot are important for examinations, as will be seen from the questions in the appendix, and also to chiropodists and masseurs but no diagrams of the muscles of the sole of the foot are given. Similarly, a diagram of the neurone would enable the students to understand the constitution of the nerve better than its very short description. Some of the figures in half tone would be better understood, if replaced by simple line drawings, *e.g.*, figure 39, depicting the back muscles. The value of the book as a guide, would have been enhanced further, by a more careful selection of structures for illustrations. Some of the sketches of surface anatomy and nerve plexuses might be replaced, without affecting the purpose of the book, by appropriate diagrams of structures which are more directly concerned with massage.

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On the whole, however, the book covers the requirements of the syllabus of the chartered society of massage and medical gymnastics, and if more attention be paid to illustrations, the book should prove a suitable guide to those for whom it has been written.

AIDS TO PRACTICAL NURSING.—By M. Houghton, S.R.N., S.C.M., D.N. (Lond.). 1938. Baillière, Tindall and Cox, London. Pp. xii plus 307. Illustrated. Price, 3s. 6d.

This will be a very useful book containing some very excellent hints for the student nurse, and as a reference book for the trained nurse.

It is very concisely put together, each chapter providing most interesting and exciting reading for the student who is anxious to learn as much as possible.

Particularly are we impressed with the last chapter which deals with the 'preparation of apparatus'; this is so often forgotten in nurses' textbooks. Miss Houghton has explained each instrument so efficiently and in such a simple way that the most junior student cannot fail to follow her every action necessary to set up each piece of apparatus.

We most sincerely recommend this book as an invaluable possession for all student nurses.

E. M. C.

Abstracts from Reports

SIXTY-NINTH ANNUAL REPORT OF THE DIRECTOR OF PUBLIC HEALTH, UNITED PROVINCES, FOR THE YEAR ENDING 31ST DECEMBER, 1936

The state of public health in the province and history of chief diseases

General health of the province.—The death rate in 1936 in these provinces from all causes showed a decrease of 2.17 as compared with the figures of the preceding year, the rates per mille of population for the two years being 22.61 and 24.78, respectively. A comparative statement showing the death rates from certain important diseases is appended below. The decrease during 1936 was noticeable under all heads except injuries and all other causes. The year 1936 has shown low death rates under all heads except smallpox and respiratory diseases as compared to decennial averages.

Chief causes of mortality	Death rate per mille for 1935	Death rate per mille for 1936	Average death rate for preceding ten years 1926 to 1935	Increase or decrease as compared with 1935	Increase or decrease as compared with decennial average
Cholera ..	0.21	0.14	0.60	— 0.07	— 0.46
Smallpox ..	0.54	0.30	0.22	— 0.24	+ 0.08
Plague ..	0.47	0.15	0.72	— 0.32	— 0.57
Fever ..	19.20	17.60	18.44	— 1.60	— 0.84
Dysentery and diarrhœa.	0.38	0.34	0.36	— 0.04	— 0.02
Respiratory diseases.	0.95	0.89	0.77	— 0.06	+ 0.12
Injuries ..	0.41	0.44	0.44	+ 0.03	..
All other causes	2.61	2.75	2.77	+ 0.14	— 0.02
All causes ..	24.78	22.61	24.29	— 2.17	— 1.68

Cerebro-spinal meningitis.—The incidence of cerebro-spinal meningitis was low this year. There were 236 deaths from this cause compared with 756 in the preceding year. Of these, 207 deaths were reported from towns and 29 deaths from rural tracts.

Out of 439 towns, cases were reported only from 37. Mortality was most marked in the towns of Agra (51), Cawnpore (38), Lucknow (19), Meerut (15), Allahabad (12) and Muttra (11) while in the remaining 31 infected towns the number of deaths reported did not exceed 8.

The incidence of the disease in rural tracts of districts was very low. Mortality was reported from only 12 districts and the number of deaths reported did not exceed 8 in any case.

The majority of the cases occurred in persons between 10 to 35 years of age. Children under one year and persons over 55 years were the least affected. It was noticed that all communities were susceptible to the disease but females were comparatively less affected than males. The disease was more prevalent among Muslims than among Hindus.

It was found that the recovery rate in cases treated in hospitals was more promising than in cases treated at residences. It is essential that people should realize the danger of the disease and come forward immediately for treatment in hospitals.

Beri-beri or epidemic dropsy.—There were 118 deaths in urban areas and 27 in rural areas, *i.e.*, a total of 145 deaths during the year compared to 380 deaths in the preceding year.

Like last year the disease again appeared in somewhat serious form in Benares city, where the active symptoms appeared mostly amongst the old cases. A few new cases were also reported from Dasaswamedh and Bhelupura wards. The disease was mainly confined to the Bengali community. Ninety-two deaths were reported from Benares alone against 304 in the previous year. In other infected towns and rural tracts of districts the number of deaths reported did not exceed 8 in any case. The disease has not yet been declared notifiable.

Malaria.—In 1936, malaria was responsible for 751,712 deaths as against 813,591 deaths in 1935 and the death rates for the two years were 15.53 and 16.81, respectively, while the recorded death rates from all causes for these years were 22.61 and 24.78, respectively. Malaria was responsible for about 70 per cent of the deaths registered from all causes.

Reporting under malaria is extremely defective and under the present system of reporting, particularly in rural areas, most of the fever cases are registered under this head. It is difficult to ascertain the direct mortality from malaria, but there is no doubt that mortality from this cause is certainly very large and forms a considerable proportion of the total number of deaths from all causes. Apart from the direct loss

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due to deaths from malaria, it has also a marked indirect action in lowering the vitality of the sufferers and making them susceptible to contract other diseases.

According to the figures supplied by the Inspector-General of Civil Hospitals, United Provinces, 1,497,346 patients were treated in all classes of dispensaries for malaria in the United Provinces during the year 1936 as compared with 1,174,745 patients in 1935, showing an increase of 322,601 patients in 1936. This increase is due to the epidemic outbreaks of malaria in 29 districts of the province during the autumn caused by unusually heavy rains and consequent flooding of the large rivers. These figures by no means represent the true index of malaria in the province and are only a fraction of the total sufferers from this disease. The figures given above with regard to deaths and sickness from malaria, however unreliable they may be, indicate that of all diseases malaria is the greatest problem of the country and anything done to fight this scourge will be a distinct economic gain to the State.

School hygiene and medical inspection of school children

The detailed examination of boys was conducted in 151 out of 161 Anglo-vernacular schools in the larger municipalities where whole-time officers are employed. The history sheets were filled for 20,500 boys, out of 54,000 on roll. Out of 508 primary and vernacular schools 175 were visited for 'ordinary' examinations, and out of 69,000 boys 15,000 were examined. About 3,000 boys were examined as 'special cases' and 7,000 were re-examined. These examinations were additional to a large number of parade inspections.

The percentage for all the main defects was over 71 in urban areas, if it is assumed that the defects were uniformly spread over all the boys and no boy had more than one defect in him. This figure for rural areas was over 38. It has also been calculated that roughly 28 per cent of boys had one defect, 11 per cent two defects and another 4 per cent more than two defects in urban areas so that there were not less than 43 per cent defectives to share all defects. These figures for rural areas were 18 per cent, 5.7 per cent and 2.8 per cent, respectively, giving a figure of 25.5 per cent defectives to share all defects. It may be remarked that the defect complex more or less remains, as the improvement in the health conditions found in schools has to be determined greatly by influences such as health education and home environment.

Anæmia.—Anæmia associated with the enlargement of spleen is due to malaria and in five years it has shown a marked fall from 3.5 per cent to 0.7 per cent in urban areas and from 7.2 per cent to 3.8 per cent in rural areas. The figures from anæmia due to other causes were comparatively small, although in 1932–33 the school health officer, Agra, reported that every seventh case of anæmia was due to intestinal parasites.

Skin disease.—The dirt diseases of the skin in urban and rural areas were 3 per cent and 3.4 per cent, respectively. The figures for rural areas showed a marked reduction as compared to 9 per cent originally and this is due to the activities of the Junior Red Cross movement in the districts.

Diseases of eyelids (Conjunctivitis and granulations).—In urban areas the incidence of these diseases was 5 per cent and in rural areas it was 6.5 per cent.

Effect of milk on poor nutrition.—The scheme of the free supply of milk to ill-nourished and poorer boys was tried in Agra, Lucknow, Cawnpore, Allahabad and Benares, where the central school dispensaries are situated. The school health officer of Cawnpore reported that each boy was given a quarter seer of milk in the middle of each working day in 10 schools, and monthly records of weight were kept and 150 boys profited by this arrangement. Although the data are meagre it is noteworthy that there was on an average an increase of 2.7 lb. in weight per head in three months' time compared with the average of 1.0 lb. of the controls, *i.e.*, a net gain of 1.7 lb. per head. In one school the milk was discontinued after three months and a fall in the average gain was noticeable, the gain being only 0.2 lb. above the average of 1.0 lb. of the controls.

In Lucknow the results of feeding on pasteurized milk in 14 schools on the same principle as in Cawnpore were worked out and showed gain in weight.

Encouraged by these results eight milk clubs were started in schools in Lucknow where the boys got milk from the Government military dairy farm on payment.

A free meal scheme was also carried out in one of the primary municipal schools of Lucknow and the same set of boys was fed by turns on whole milk, separated milk, gram, *moong*, soya bean and parched wheat and it was noted that the gain in weight was most marked when the boys were fed on milk or separated milk.

In Benares where pasteurized milk was supplied free to 290 boys with a total of about 21,000 meals of a quarter seer of the milk, over 90 per cent showed a marked increase in weight, the gain being greater among those who were less nourished.

Pasteurized milk in the same quantity as elsewhere was supplied to 252 boys in Allahabad.

REPORT OF THE SUDAN MEDICAL SERVICE FOR THE YEAR 1936

Yellow fever.—Survey work has been continued as follows:—

(1) The examination of liver sections from fatal cases of pyrexia of obscure origin. The tissue is obtained either by viscerotomy or at post-mortem examinations.

During the year 16 livers from all parts of the country have been examined histologically, but in no instances were the changes suggestive of yellow fever.

(2) Mouse protection tests.

(A) A series of sera was collected from the natives of the Eliri district of the Nuba Mountains, and forwarded to Dr. G. M. Findlay of the Wellcome Bureau of Scientific Research, London, for mouse protection tests.

The results were as follows:—

Of 27 sera from Eliri 12 (44 per cent) were positive and 15 (56 per cent) were negative.

Of 18 sera from Lafufa 5 (28 per cent) were positive and 13 (72 per cent) were negative.

Of 5 sera from Nyaro 3 (60 per cent) were positive and 2 (40 per cent) were negative.

Of 38 sera from Kau 30 (79 per cent) were positive and 8 (21 per cent) were negative.

Of 31 sera from Heiban 3 (10 per cent) were positive and 28 (90 per cent) were negative.

Of 39 sera from Gulfan 8 (21 per cent) were positive and 31 (79 per cent) were negative.

The results indicate that there has been a widespread infection with the virus of yellow fever throughout the Nuba Mountains during the last 20 years, the youngest individual in whom a positive was obtained being 12 years of age. Careful investigations, however, have not so far discovered any clinical cases of yellow fever. The results at Kau are particularly interesting where almost 80 per cent of the population have positive sera, but where there is a complete absence of any history of jaundice or other suggestive clinical condition. The evidence at present is that the infection is entirely subclinical, but a permanent dispensary has been established at Kau with a view to obtaining as completely as possible a medical history of the population throughout the year.

Another interesting point, which it is hoped to investigate more fully, is the striking difference in the percentage of positive sera in adjacent and apparently similar districts.

(B) During the year the mouse protection test has also been carried out on the sera of a number of cases of obscure febrile jaundice. Of 25 cases examined two, one from Malakal and the other from Medani, have given positive results. As the sera of these cases were not examined at the onset of the illness, these results are of little significance, the available evidence suggesting that they were due to some previous infection.

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(C) Results of mouse protection test with animal sera.

Monkeys—14 *Cercopithecus æthiops* and 1 *Cercopithecus phyrrhonotis* have been tested. The latter was negative, and of the former one was positive and 13 negative. Unfortunately it was not possible to determine the original habitat of the monkey whose serum was positive.

Cows—Sera from 13 cows from Khartoum, White Nile and Western Kordofan have been examined. Those from Khartoum and the White Nile were negative, while of those from Kordofan 2 out of 4 were positive both of which came from areas where positive human sera have been found previously.

Investigations are being continued on these lines, and extended to include other species of wild and domestic animals.

ANNUAL REPORT OF THE MYSORE STATE DEPARTMENT OF HEALTH FOR 1936

THE state of public health was satisfactory in the year under report. A decline in the incidence of plague was observed, and, as compared with the previous year, a big fall in the mortality from smallpox was registered. Cholera, which had been forecasted by the department months in advance, showed a small rise towards the end of the year, and adequate measures were undertaken to prevent its spread. The total mortality during the year amounted to 96,278 deaths, giving a death rate of 14.31 per mille of population; and the reported births numbered 1,36,569 with a birth rate of 20.31, the death and birth rates in the previous year being 14.54 and 20.45, respectively.

Studies made during the year have shown that cholera is likely to spread into the State from outside, and therefore in an effective control of the outbreak of this disease it will be necessary to give protected water supplies to the villages within a belt of about 10 miles along the frontiers. Action has already been taken in this connection and Rs. 2,600 has been sanctioned under the rural water supply scheme for sinking wells in 8 such villages.

The statistics of malaria deaths collected during the year show definitely that nearly a third of the deaths reported are due to malaria. It is important therefore that immediate steps should be taken to relieve the situation. In this connection, it may be noted that the District Board, Shimoga, distributed about 20,000 quinine pills in badly-infected villages at a cost of Rs. 500. But many of the sufferers are without any sort of treatment either because of distance from the nearest dispensary or for want of helpers to fetch the medicine. Anti-mosquito measures in villages will take money and time and it is obvious that free distribution of quinine should be immediately undertaken among the needy. The distribution could be made by the village *panchayets*, the revenue department through the revenue inspectors and the health department through the sanitary inspectors and vaccinators.

The scheme for the experimental control of malaria in 10 villages in the Irwin Canal Area sanctioned in 31st January, 1935, with the co-operation of the Rockefeller Foundation for a period of one year, was sanctioned for a further period of one year financed solely by the Government.

On a co-operative basis between the Government and the Rockefeller Foundation, the Government sanctioned the organization of a health training centre at Closepet, the entire cost being met by the Government after a period of five years.

A committee was appointed to examine the question of correct registration and compilation of vital statistics in Mysore State and the statistics of maternity and child welfare. The committee have submitted their report to Government for consideration.

Health exhibitions on a large scale were organized on the occasion of the Health and Baby Week in Bangalore city in May. It is proposed to make such exhibitions a great success in future with the addition of models on the various aspects of public health work.

The League of Nations Commission for Rural Health visited Mysore, Nagenhalli, Mandya and Closepet in the latter part of the year and saw the progress made in rural health and malaria control work.

Maternity and child welfare.—Dr. Jean M. Orkney, Director of Maternity and Child Welfare Bureau, Indian Red Cross Society, New Delhi, visited the State and saw the activities of welfare centres in Mysore and Bangalore cities and in a few rural areas.

Government have approved of four types of maternity homes:—

(*i*) Maternity home for a village.
(*ii*) Maternity home for a village combined with quarters for a midwife.
(*iii*) Maternity home for a village combined with a child welfare centre and quarters for a midwife, and
(*iv*) Maternity home for a village combined with a child welfare centre and quarters for a midwife and a dispensary.

Baby weeks were held during the year in 43 places excluding Tumkur district under the auspices of the Red Cross Society, the village *panchayets*, the district boards and municipalities. The organizer attended 12 of these as against 16 in the previous year. Baby weeks, when held, should serve the purpose of evaluating the working of infant and child welfare centres working during the previous year and focus the attention of the general public in health matters.

A number of special circumstances combined to make the year 1936 an exceptionally busy one. In the first place, there was the distribution by the Government of the whole of the Silver Jubilee Fund, added to which was the munificent donation of Rs. 25,000 by Her Excellency Lady Willingdon for an anti-tuberculosis dispensary. In the second place, the year witnessed the commencement of the Government's drive for village improvement in selected villages, the promotion of maternity and child welfare work being one of the principal items of this programme. In the third place, there has been quite a remarkable wave of enthusiasm for the work of the kind on the lines of the programme that was worked out in 1935, and donors and other promoters of schemes for maternity homes and similar buildings are coming forward in such numbers that it has put quite a strain on the staff to organize and adjust the claims of the various competing schemes.

Health education.—During the year 165 cinema shows were organized, as compared with 178 in the previous year, and approximately 88,000 persons attended these shows. The Publicity Officer in charge explained the films in Kanarese.

A film on leprosy prepared with local settings under the auspices of the State Leprosy Relief Committee was handed over to the department for demonstration in different parts of the State. It is proposed to purchase a new film on maternity and child welfare from the Public Health Department, Madras Presidency.

As in previous years a Health Stall was put up at Mysore in connection with the Annual Swadeshi Exhibition and the Dasara Exhibition. Similar stalls, on a smaller scale, were also put up at the Health and Baby Shows at Mandya and Mugur. In connection with the Health and Baby Week in Bangalore city in May, a Health Exhibition was organized representing the activities of the various sections of the department.

Health training centre.—The activities of the Health Training Centre at Closepet began in May with the co-operation of the Rockefeller Foundation.

The Health Officer was deputed to Ceylon for a month during November and December and in his absence Mr. S. Ramachandra Rao was in charge of the Centre.

The area of the Centre comprises 113 square miles with a population of 50,673 distributed in 72 main and 63 dakle villages in five divisions.

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The sanitary inspectors, during the year, paid 1,909 visits to their villages at the rate of between 1 and 2 visits per village per month.

As part of public health propaganda, the sanitary inspectors gave 4,202 talks on various health topics to a total audience of 53,460 persons, the average attendance being 13. It was found difficult to get the people to attend these talks and the usual method of talking to the groups that collected around the staff during their visits to the villages had to be adopted. It will be possible to organize systematic lectures in future with the attraction afforded by the magic lantern.

Chlorination of all the wells in the area was started in October and all the 1,273 private and 177 public wells were treated with perchloron by the end of December. It is proposed to chlorinate the wells once every quarter.

To collect whatever information was available and to see to what extent these figures were dependable were two of the problems that had to be attended by the staff at the outset. The procedure adopted is as follows: In order to estimate how many occurrences actually miss being reported, the sanitary inspectors undertake an intensive itineration of all the villages during the second week of every month, collecting the detailed information regarding births and deaths through personal enquiry. After having thus collected the information independently, they check the patels' registers and note down the number of occurrences that have escaped entry.

In the last five months of 1936, 314 out of a total of 913 births (or 34.4 per cent) and 138 out of a total of 452 deaths (or 30.5 per cent) were missed by the patels.

Vital statistics.—During the year, a special committee was appointed by Government for examining the question of improving the registration and compilation of vital statistics in Mysore State. The committee considered the various aspects of the problem and have submitted their report to Government for orders.

As indicated in the previous report, the figures returned under the following causes, for the second year of reporting, show definitely that the registration of vital occurrences by the agency of the patels is not unacceptable:—

Causes	Deaths in 2nd year of reporting (1936)	Deaths in 1st year of reporting (1935)
Malaria ..	29,995	24,643
Typhoid ..	4,856	4,071
Consumption ..	4,892	4,510
Leprosy ..	870	714
Child-birth ..	2,128	2,205
Drowning ..	865	779
Snake-bite ..	163	154
Rabies ..	68	54

Although somewhat incomplete, these figures may be taken to indicate their relative magnitudes so far as the State is concerned. The fact that so few deaths have been reported as due to leprosy and rabies, both in 1935 and in 1936, shows beyond doubt that the statistics reported by the patels are, and can be proved to be, not untrue.

THE NAIR HOSPITAL DENTAL COLLEGE, BOMBAY: FOURTH ANNUAL REPORT, 1936-37

This report records another year of steady progress in every respect. More students are being taught, further equipment has been added and the number of patients treated has risen from 8,554 to 9,727 in the course of the last year. This college appears to be now firmly established and as the years pass its value to Bombay in particular and India in general should become evident as in training dental surgeons it is producing a type of professional man of which there are all too few in India at present.

ANNUAL REPORT OF THE PUBLIC HEALTH COMMISSIONER WITH THE GOVERNMENT OF INDIA FOR 1936*

Volume I

Public health.—The provision of a sanitary environment forms the foundation on which alone the superstructure of public health can safely be built. The supply of wholesome water, efficient removal and disposal of refuse and nightsoil, the suppression of nuisances, public cleansing, improved housing and the inspection of food supplies—these are some of the basic requirements of a community if it is to maintain a reasonable standard of health.

There can be little doubt, that, if local bodies devoted the necessary funds towards the provision and maintenance of protected water-supplies, they would obtain more than an adequate return in terms of better health for the populations under their care.

The provision of markets and slaughter houses and their sanitary supervision form an important function of local authorities, both urban and rural.

Even where markets of a reasonably sanitary standard are in existence, the local authorities concerned frequently fail to prohibit the sale of food in unauthorized places and take no steps to prevent food contamination.

Rural health centres serve the purpose of testing out methods of rural health administration and of arriving at probable estimates of cost, while they also afford excellent opportunities for the field training of public health workers and students.

But rural health problems cannot be solved by public health measures alone and no scheme for rural development can be considered adequate unless it provides for a many-sided attack on the physical, social, economic and educational aspects of village life. The suggestion is, therefore, made that a Rural Development Council should be formed at the headquarters of each province, with a district council for each district.

Adulteration of food is another matter of considerable importance, which calls for attention. Unfortunately, however, in most provinces, no food adulteration act is in force in rural areas and, even in urban areas, where legal provisions exist, their enforcement leaves much to be desired. In some places, 50 per cent or 60 per cent of the samples taken were found to be adulterated, whilst, with respect to individual articles, the percentage was even higher.

A school medical service is one of the most important parts of public health administration. Experience all over the world has shown that the provision made for the health of the school child, by periodical examination and the correction of defects, has proved to be a sound investment in respect of betterment of the national health.

In some provinces attempts have been made to supplement the diet of poorly nourished school children by the free supply of milk or of midday meals, but these have been tried in very limited areas only.

In order that mal-nutritional defects—now known to be common—should be corrected and that systematic medical care of school children should be taken, rapid development of school medical services on an adequate scale is urgently required all over the country.

Central health board.—Experience has indicated the necessity for continued co-ordination of effort, not only for the exchange of ideas, but also for the formulation

*The annual report of the Public Health Commissioner with the Government of India for the year 1936, Volume I, is now on sale with the Manager of Publications, Civil Lines, Delhi. It is also obtainable from Provincial Government Book Depôts and from private booksellers who stock Government publications.

With a view to facilitating its purchase by local bodies, health officers, medical officers and private individuals a specially reduced price of rupees two per copy, inclusive of packing and Indian postage, has been fixed for this publication.

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of reasonably uniform lines of development. To serve these purposes a central consultative body, the Central Advisory Board of Health, was formed last year, on which are represented the Health Ministers of all the provinces assisted by their principal health and medical advisers. The machinery for co-ordinating public health work in India has thus been established and it may be anticipated that the coming years will witness increasing progress in every phase of public health activity.

Mortality.—Of a total of nearly 6,400,000 deaths or 23 per mille in British India in the year 1936, which is the latest year for which consolidated figures are available, approximately 160,000 or 0.6 per mille were from cholera, 105,000 or 0.4 per mille from smallpox, 13,000 or 0.05 per mille from plague, 3,600,000 or 12.7 per mille from 'fevers', 280,000 or 1.0 per mille from dysentery and diarrhœa, 490,000 or 1.8 per mille from respiratory diseases, and 1,730,000 or 6.1 per mille from other causes.

Plague.—Deaths from plague during the year were the lowest on record since 1896 when plague first came into India. Of the provinces, the N. W. F. Province, Delhi, Orissa, Assam and Ajmer-Merwara were completely free of the disease, the United Provinces was the worst affected, recording about 56 per cent of the total mortality in British India.

Cholera.—Cholera mortality also fell during the year by about 57,000. The decrease in incidence was common to most provinces, the important exception being Bengal where the mortality was 1.5 per mille or 25 per cent higher than that of the previous year.

India, however, unhappily still continues to live up to its evil reputation of being *the* important world reservoir of cholera infection.

Provincial public health staffs have generally done good work within recent years in the sanitary control of the numerous fairs and religious festivals, which are held all over the country. Whilst previously it was common for explosive outbreaks of cholera to occur at these centres and to be followed by widespread infection, the elaborate precautionary measures now generally in force have largely been effective in preventing dissemination of the disease from these dangerous foci.

Smallpox.—In the Philippines, the rigorous enforcement of vaccination has been followed by the almost complete elimination of the disease. 'After vaccination of the inhabitants of the six provinces in the vicinity of Manila, which had an annual mortality of 6,000 from smallpox, the deaths from this disease were reduced to insignificant numbers. In Manila, with a population of over 250,000, not one death from smallpox occurred in a period of seven years. More than 10 million vaccinations were performed between 1905 and 1915 without loss of life or limb, showing that vaccination in itself is practically unattended with any risk.'

India recorded over 100,000 smallpox deaths during 1936. Among the individual provinces, Bengal reported the largest mortality, deaths numbering about 46,000 or 44 per cent of the total recorded in British India. Compared with 1935, the increase was as high as 800 per cent.

Only about 49 per cent of infants available for vaccination in British India were successfully vaccinated during the year. This figure indicates how much remains to be done and when it is noted that in Assam, Bengal, Bihar, Orissa and Madras the percentages are as low as 22 to 37, it is evident that the vaccination staffs of these provinces have still got a large leeway to make up, but unfortunately no public health department is sufficiently manned to enable it suitably to deal with the whole of the population under its control.

Further, vaccination is compulsory only in about 75 per cent of the towns and in less than 50 per cent of the rural areas and the enforcement of law leaves much to be desired even in compulsory areas.

Fevers.—'Fevers' were responsible during the year for nearly 56 per cent of the total mortality. It no doubt mainly consists of deaths from malaria, but it also includes large numbers of deaths from other diseases in which fever is a prominent symptom.

Malaria.—An estimate is made that the annual deaths from malaria in British India total 1¼ millions and that about a hundred million persons suffer from this disease each year. During the past decade, cholera, smallpox and plague, the three infectious diseases which generally attract most notice, were together responsible for about 357,000 deaths each year, a figure which is less than one-third of the annual toll of life taken by malaria.

'No satisfactory general method of bringing malaria under rapid and effective control in rural areas at a cost within the means of the people has, however, been evolved in any malarious country in the world', as the Director of the Malaria Survey of India remarks. The policy to be adopted must therefore be directed to such amelioration of conditions as may be practicable rather than to expensive methods of control, and with this end in view, every effort should be made, in the first place, to encourage the consumption of quinine.

A special grant of Rs. 10 lacs was given in 1935-36 by the Government of India to the Indian Research Fund Association mainly for anti-malarial work.

It is estimated that India's probable annual requirements of quinine for the purpose of effective mass treatment amount approximately to 600,000 lb. Her present consumption is only about a third of this quantity, of which nearly 110,000 lb. are imported and 90,000 lb. are produced in the country. Any cheapening of the cost of quinine is, therefore, dependent on a considerable expansion of India's production.

Tuberculosis.—There is strong evidence that tuberculosis, particularly of the pulmonary type, has markedly increased within recent years in certain areas. The most urgent need is the provision all over the country of a chain of tuberculosis clinics where skilled treatment and advice can be obtained from trained staffs of medical officers, nurses and home visitors, increase in the number of beds in hospitals and establishment of sanatoria for tuberculosis cases and the institution of tuberculosis colonies and settlements at a later stage.

No national effort on these lines and of the magnitude necessary for this country can be successfully undertaken without the fullest co-operation of the people, of the provincial governments, local authorities and voluntary agencies.

Leprosy.—In India, the incidence of the disease is highest along the eastern coast of the peninsula and in the western parts of Bengal. From the eastern belt of high prevalence the disease gradually diminishes in incidence to the north and west, until a fairly wide area of comparative freedom from the disease is reached, comprising the northern half of Bombay Presidency, including Gujarat, Rajputana, the western portion of the United Provinces, the Punjab, the N. W. F. Province, Sind and Baluchistan.

Within recent yeras, a considerable expansion of treatment activity has resulted from the provision of leprosy clinics in different parts of the country, but whilst present methods of treatment are of undoubted value in a proportion of cases, the leprosy problem cannot be solved by treatment alone.

Cancer.—If more reliable data were available, the prevalence of cancer in India would be found to be little different from that of Western countries.

Though no definite campaign has so far been planned, radium is available in four or five institutions, including the Lady Hardinge Medical College, New Delhi, the Radium Institute, Patna, Bihar, the Chittaranjan Seva Sadan and the Bengal Cancer Institute, Calcutta, and the Barnard Radiological Institute in Madras.

Maternity and child welfare.—Maternity and child welfare work has made notable advances since its inception as a national movement in India in 1918, but there are still large gaps in the services, particularly in the field of obstetrics, which must be filled before material improvement in the health of the nation can be assured.

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Sufficient information is now available, as the result of special inquiries, to show that maternal mortality in India is probably five or six times as high as that of England, and when it is remembered that a high death rate implies a correspondingly high rate of sickness, the extent of suffering and invalidism which child-bearing causes in India can well be imagined.

Apart from beds for abnormalities arising during pregnancy, labour and the lying-in period, beds are also required for women whose domestic surroundings are unsuitable.

Increasing numbers of women are now seeking admission to hospitals for confinement, and this demand is being met to a certain extent by the establishment of maternity homes, which are often unsatisfactory from the point of view of equipment and skilled attendance. The movement is, therefore, not without risk, and some control of the standards and methods of these institutions would seem to be necessary if the lives of mothers are to be suitably safeguarded.

Maternity and child welfare schemes are based on a system of home visiting, of ante-natal and post-natal clinics and centres, where infant and pre-school child consultations are conducted and classes can be arranged for the mothers. Each year shows a diminution in the number of so-called welfare centres staffed by untrained workers. The primary objects of maternity and child welfare work are to educate parents in the nurture of a healthy race and to prevent disease, and these objects can be achieved only by the employment of trained health workers.

The trained health visitor is the vital unit in any maternity and child welfare scheme, just as home visiting is the basic service for which she is responsible.

The contributions hitherto made by voluntary organizations and individuals have been of great value, but a stage has now been reached when responsibility for the training of workers and the technical direction of the work should be assumed by governmental departments.

Research activities.—A study has been made for the last four years, and is still in progress, of the organism responsible for cholera, and considerable advance has been made with respect to the identification of the true cholera organism as distinguished from various related organisms found in tanks, rivers and other water supplies all over the country. These investigations have been in the nature of a co-ordinated study in which a number of different laboratories took part and a second form of attack is being made on the problem through field enquiries.

Another important line of study has been that of the rôle of the fly in the causation of cholera. Work on this subject is still in progress in more than one province.

Researches have also been carried out on the problem of malaria. Along with other subjects these included (1) study of the life-history of malaria-carrying mosquitoes, (2) testing of the value of certain anti-malarial drugs, (3) investigation of the conditions under which transmission of the disease takes place, (4) malaria surveys, (5) malaria control experiments in different groups of villages and (6) investigations into the causation and cure of the dreaded condition known as blackwater fever, which is frequently associated with hyperendemic malarious regions.

A serum for the treatment of plague patients has been prepared and is now under field trial. The results so far obtained have been quite hopeful, but further research is required before it can be said that a new weapon has been found for the fight against this disease.

The causes underlying the recrudescence of plague after periods of freedom from infection have been under investigation, present conditions providing a favourable opportunity for such studies in view of the comparatively low prevalence of the disease.

Field studies with cyano-gas have been going on for some time.

Work done in the different laboratories have covered a very large field and has included such widely different subjects as the action of snake venoms, drug addiction, filariasis, cancer, trachoma and epidemic dropsy, to mention only a few.

Hospitals and dispensaries.—The number of hospitals and dispensaries of all classes in British India during the year was approximately 6,900 and the average population served by each institution is nearly 41,000. Whilst the average population served by each institution in urban areas reached the maximum of 20,000 in Delhi Province, the corresponding number of rural areas was as high as 124,000 in the U. P. and 104,000 in Bombay Presidency. These figures indicate the urgent need for an extension of rural medical relief.

Correspondence

A GAS MASK FOR POST-MORTEM WORK

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—To those whose lot it is to perform post-mortem examinations on decomposed dead bodies in the hot damp weather it may be of interest to hear that I have found a gas mask of great value in this type of work. It affords complete protection against all foul-smelling gases and permits of a thorough examination in circumstances where ordinarily such examination would be almost unbearable due to foul odours.

The gas mask used has been purchased from the Chief Ordnance Officer, Allahabad Arsenal, for Rs. 17-5-6 plus freight and is the Regulation Army Respirator Anti-Gas Mask IV.

To my knowledge a gas mask has not been used for this purpose before nor is it mentioned in any of the commonly used textbooks on jurisprudence in this connection. This is the justification for sending in this note.

Yours, etc.,

S. AHMAD, M.B., B.S. (Punj.), F.R.C.S. (Eng.), L.R.C.P. (Lond.), CAPTAIN, I.M.S.,
Civil Surgeon.

SITAPUR,
UNITED PROVINCES,
23*rd August,* 1938.

ANAHÆMIN IN TROPICAL MACROCYTIC ANÆMIA

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—In a paper entitled 'Anahæmin in Tropical Macrocytic Anæmia' published in your July issue of this year, Napier and others refer to my review of the work of Dr. Lucy Wills and her co-workers (1937) which showed that in the nutritional macrocytic anæmias of monkeys the more highly purified liver extracts might be less efficacious than the less purified ones. The quotation ends as follows in inverted comas, 'In the reviewer's experience no clinical evidence of this danger is at present available....' It is unfortunate that the rest of the quotation was not given in the paper and that it was not made plain that my remarks referred to Addisonian pernicious anæmia and not to tropical macrocytic anæmia. The insertion of the remaining lines of my review in the 1938 *Medical Annual* makes this plain, for it continues—'Since, the improvement in the blood and central nervous system changes of his patients with pernicious anæmia has been as great and as quickly and easily produced with the recent highly purified preparation anahæmin as with the less purified preparation campolon'. This is the opinion also of Murphy of Boston who uses the highly purified extract made by the Lederle Company in 1 c.c. doses, and by Ungley of Newcastle and other leading hæmatologists in this country. This statement does not deny the possibility that the less highly

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purified preparations might be more efficacious in tropical macrocytic anæmia.

Dr. Napier is working on a very valuable problem in trying to separate the large group of tropical macrocytic anæmias into smaller divisions by means of the therapeutic test. The difficulties are obviously great as judged by the variable and inconsistent responses which are reported in the different cases. It is difficult to compare different liver extracts with one another unless they are both used on a single case because of the variable response which individuals show to treatment. Another difficulty lies in reckoning what should be considered comparable doses of the different liver extracts to be tested; for instance, in case 8 conclusions are drawn in regard to the increased activity of campolon compared to anahæmin when the patient received only 2 c.c.'s of anahæmin as compared to 20 c.c.'s of campolon. Probably the same criticism is applicable to case 9, but unfortunately the number of days on which 4 c.c.'s of campolon was given is not stated.

Lastly, I would draw attention to the fact that batches of anahæmin were placed on the market last year which were of low potency. Some of our cases of pernicious anæmia showed little or no response to 2 to 4 c.c.'s of anahæmin. I understand that the potency of anahæmin at present on the market is extremely high. If therefore Dr. Napier and his colleagues had been so unfortunate as to use a batch of anahæmin of poor quality, this would be another factor in making it difficult to assess the comparative value of different liver extracts in the treatment of tropical macrocytic anæmia.

Yours, etc.,

L. S. P. DAVIDSON, B.A., M.D., M.R.C.P., F.R.C.P.E., F.R.S.E.,
Regius Professor of Medicine,
University of Aberdeen,
Practice of Medicine Department.

FORRESTERHILL,
22*nd September,* 1938.

[We are very pleased to get this opportunity to apologize for what we now see to have been an unjust criticism of Professor Davidson's review of Dr. Lucy Wills' work. The apology is not on account of the incompleteness of the quotation in question; in this matter we had no intention of misleading the reader. The paper Professor Davidson was reviewing was mainly concerned with experiments in nutritional anæmia of monkeys and the arguments in this paper were mostly applied to tropical macrocytic anæmia by analogy, but what we had overlooked was that Dr. Wills and her collaborators had specifically suggested that there might be some cases of pernicious anæmia 'which would either not respond to anahæmin or make a poor temporary response, but would respond to the cruder preparations such as campolon'. This of course makes Professor Davidson's remarks both relevant and necessary.

Another point he raises is in connection with the different dosages. We ourselves drew attention to this weakness in our conclusions. However, other workers have shown that very much smaller doses than we gave, as low as 25 milligrammes, will produce a reticulocyte response in pernicious anæmia. We did not give more than 200 mgm. because at that time our supply of anahæmin was very limited. In case 9 to which he refers, he is correct in assuming that a large total dose of campolon was given (this is clearly shown in the chart which is drawn to scale), but the early reticulocyte response indicated that it was the first or possibly the first two injections that produced this effect.

The last point that he raised was gone into very carefully by myself personally in London when I visited the laboratories of the manufacturers. Our supplies were obtained directly from the agents in India and there seems little chance that any of the samples were of low potency. Further, our findings have been confirmed subsequently by Drs. Wills and Evans.

The manufacturers have generously given me a further larger supply of anahæmin to continue this work. This has enabled us to give larger doses with the result that in a number of cases we have obtained a sharp response, comparable to that hitherto obtained with campolon, though we have also confirmed our previous observations regarding its failure in certain other cases, even when large doses are given.

L. E. NAPIER.]

CONGENITAL ABSENCE OF EYEBALLS

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—A girl of 3 days age has been brought to me, as she never opened eyes since birth. I find that the eyeballs are absent. This is a very rare case of congenital absence of eyeballs. This may please be published for record.

Yours, etc.,

ABDUL AZIZ, M.B., B.S., P.C.M.S.,
Assistant Surgeon.

SHAHPUR,
22*nd August,* 1938.

CHLOROFORM AS A LOCAL ANÆSTHETIC

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—Using chloroform as a local anæsthetic, I have done about 40 tooth extractions including the digging out of stumps by elevators and the use of the gum lancet, and also opened a few abscesses on other parts of the body. The results have been uniformly good, indeed almost dramatic in some instances for the patient, the onlookers and the operator. The object is achieved in an incredibly short time with but little pain and hardly any other effects.

The method is as follows:—

A piece of lint soaked in chloroform is wrapped round the tooth and gum, or applied to the abscess for about 2 or 3 minutes. This secures sufficient anæsthesia for a quick operation. Those who have used the syringe and one of the novocain preparations for local anæsthesia know how patients dread the 'poke'. Indeed the operation of securing anæsthesia is more painful than the actual extraction or the incision. This is understandable because the tissues are inflamed all round and the slightest touch, and much more a jab, is exquisitely painful. Patients would prefer general anæsthesia, if they were convinced that there would be no danger to life and no after-effects; this is my personal feeling too as a patient. In addition I consider the effects of hypodermic anæsthesia are erratic, varied, and in general unreliable.

How chloroform acts when applied in this method of local anæsthesia I do not know. It seems to me that it acts as a local cellular poison paralysing the end-plates. I have found that ether similarly applied is not nearly so effective; indeed its effects, if any, are evanescent and its use painful, probably due to the contraction of the muscular coat of blood vessels preventing access of the anæsthetic to the end-plates and causing pain by local syncope. Ethyl chloride acts like ether but is more unpleasant.

I am of opinion that unless 'nerve block' is secured by the use of syringe and novocain local anæsthesia by their use is bound to be untrustworthy and painful because it depends entirely on luck for striking the end-plates. Beginning with hypodermic or intra-dermal anæsthesia I have had on many occasions to resort to general anæsthesia. Perhaps, my technique for the production of local anæsthesia by the syringe was faulty.

There is one thing, however, which may tend to take away a little from the usefulness of the method now advocated. Is it not possible that 'suggestion' has played some part in the success that has attended my cases? My first few cases, on whom I used chloroform in this way, may have been exceptionally strong men, quite impervious to pain, and who would not have winced, even if no anæsthetic had been used. Firmly

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convinced myself, it may be said, by auto-suggestion, I tell my patients that they will have no pain. The experience of others may determine if 'suggestion' plays a part in the successful results obtained. The speed with which the operation is performed seems to me to be a very important element in the use of this method of local anæsthesia. It would almost appear as if I depend mostly on suggestion and speed.

However produced the anæsthesia has been good and it is considered the method is worthy of further trial.

Yours, etc.,

G. B. S. CHAWLA,
MAJOR, I.M.S.,
Officiating Commanding, Combined Indian Military Hospital.

LANDIKOTAL,
10*th May*, 1938.

Service Notes

APPOINTMENTS AND TRANSFERS

MAJOR-GENERAL W. H. HAMILTON, C.B., C.I.E., C.B.E., D.S.O., K.H.P., to be Officiating D. M. S. in India. Dated 11th August, 1938.

The services of Major-General N. M. Wilson, O.B.E., K.H.S., are replaced at the disposal of the Government of Madras, with effect from the forenoon of the 17th September, 1938.

Colonel C. A. Wood, M.C., to be Officiating A. D. M. S., Peshawar District. Dated 6th August, 1938.

Colonel F. F. S. Smith to be Officiating D. D. M. S., Northern Command, in addition to his other duties. Dated 11th August, 1938.

Lieutenant-Colonel B. Prasad to be O. C., I. M. H., Alipore. Dated 10th August, 1938.

Lieutenant-Colonel J. E. Ainsley reverted from civil employment, on 3rd August, 1938, from Central Provinces.

Lieutenant-Colonel M. S. Joshi to be O. C., C. I. M. H., Landikotal. Dated 14th August, 1938.

Lieutenant-Colonel W. P. Hogg, D.S.O., M.C., an Agency Surgeon, is employed as Chief Medical Officer and Inspector-General of Prisons in Baluchistan, with effect from the forenoon of the 22nd August, 1938.

The services of Lieutenant-Colonel B. H. Kamakaka, M.C., are replaced at the disposal of His Excellency the Commander-in-Chief in India, with effect from the forenoon of the 22nd August, 1938.

On return from leave Lieutenant-Colonel H. Chand assumed charge of the Office of Civil Surgeon, Sialkot, on the 21st September, 1938.

Lieutenant-Colonel J. H. Smith, on return from leave, was appointed Civil Surgeon, Maymyo, from the forenoon of the 27th September, 1938, *vice* Major R. McRobert transferred.

Lieutenant-Colonel J. Findlay was appointed to officiate as Inspector-General, Civil Hospitals, Burma, from the 27th September, 1938, forenoon, *vice* Colonel N. S. Sodhi who proceeded on leave.

Lieutenant-Colonel I. S. Nalwa was appointed Officiating Inspector-General of Prisons, *vice* Lieutenant-Colonel J. Findlay.

The services of Lieutenant-Colonel R. C. Clifford, M.C., D.S.O., are placed at the disposal of the Chief Commissioner, Delhi, for appointment as Civil Surgeon, New Delhi, with effect from the 15th October, 1938.

Lieutenant-Colonel J. M. R. Hennessy, Civil Surgeon, on return from leave, is re-posted to Jubbulpore.

On return from 8 months and 1 day's leave (29 days' leave cancelled), Lieutenant-Colonel A. H. Shaikh is posted to Bareilly Central Prison, *vice* Major G. D. Malhoutra.

Major S. D. Gupta to be Specialist in Radiology, Deccan District. Dated 4th August, 1938.

Major M. K. Kelavkar, M.B.E., is appointed Assistant Director-General, Indian Medical Service (Stores), with effect from the forenoon of the 28th October, 1938.

Major W. Scott, on return from leave, is posted as Civil Surgeon, Amraoti.

The Notification placing the services of Major H. W. Mulligan at the disposal of the Government of Madras is hereby cancelled.

Major R. McRobert was appointed Civil Surgeon, Prome.

Major V. S. Rao Pandit was posted to the charge of the Rangoon Central Jail, in place of Lieutenant-Colonel I. S. Nalwa.

Major G. R. M. Apsey, on return from leave, was appointed Civil Surgeon, Akyab.

The services of Major G. D. Malhoutra, Superintendent, Central Jail, Bareilly, have been transferred from the Jail Department to the Medical Department. He has been posted as Civil Surgeon, Shahjahanpur.

The Secretary of State for India has appointed the undermentioned officers to the Indian Medical Service (Civil), with effect from the dates specified against their names, and they are placed at the disposal of the Government of Burma from the same dates:—

Captain S. W. Allinson. Dated 17th April, 1938.
Captain J. G. Stonham. Dated 18th May, 1938.

Captain W. W. Laughland to be Officiating Mental Specialist, Southern Command. Dated 12th August, 1938.

Captain V. E. M. Lee, reverted from civil employment, on the 19th August, 1938, from Central Provinces.

Transferred to civil employment

Captain L. Feinhols on 6th August, 1938, as Surgeon to H. E. the Governor of Bombay.

Captain W. B. Stiver on 28th August, 1938, to Bihar.

Captain E. Parry was transferred to military employment in Burma, with effect from the 28th August, 1938.

Captain D. K. L. Lindsay, on return from leave, was appointed Civil Surgeon, Shwebo.

Captain V. Srinivasan, Civil Surgeon, Jubbulpore, is transferred to Bilaspur.

LEAVE

Colonel N. S. Sodhi was granted 4 months' leave from the forenoon of the 27th September, 1938.

Lieutenant-Colonel A. J. D'Souza is granted 10 months' leave, from the 1st October, 1938.

Major R. A. Wesson, Civil Surgeon, Moradabad, has applied for 2 months' extension of leave, in continuation of 8 months' leave previously granted to him.

Major G. J. Smith was granted 7 months and 15 days' leave, from the 2nd September, 1938.

Major E. S. S. Lucas, Civil Surgeon, Agra, proceeded on 4 months' leave, with effect from 3rd September, 1938.

Major H. W. Farrell, an Agency Surgeon, is granted leave on average pay for 6 months combined with study leave for 4 months, with effect from the afternoon of the 17th September, 1938.

Major F. M. Collins, Acting Principal and Professor of Surgery, Medical College, and First Surgeon, King George Hospital, Vizagapatam, is granted leave for a period of 8 months, with effect from the 17th November, 1938, or date of relief, whichever is later.

Major E. G. Montgomery, Civil Surgeon, Dacca, is granted leave for 15 months, with effect from the 23rd October, 1938, or from any subsequent date on which he is relieved.

Captain J. P. J. Little proceeded on 10 months' leave, from the 8th September, 1938.

PROMOTION

Captain to be Major (Provl.)

A. K. Gupta. Dated 15th July, 1938.

Captains to be Majors

V. E. M. Lee. Dated 1st August, 1938.
G. B. W. Fisher. Dated 2nd August, 1938.
E. P. N. M. Early. Dated 6th August, 1938.
W. McAdam. Dated 6th August, 1938.

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G. F. Condon. Dated 15th August, 1938.
V. Srinivasan. Dated 25th August, 1938.

Dated 1st December, 1938

H. S. Smithwick.
D. Tennant.
D. P. Mitra.
N. J. U. Mather. Dated 18th September, 1938.
B. S. Sandhu. Dated 26th September, 1938.
W. Laurie. Dated 8th June, 1938, with seniority from 10th September, 1937.

RETIREMENT

Lieutenant-Colonel H. G. Alexander. 16th August, 1938.
Lieutenant-Colonel E. H. V. Hodge, C.I.E., 28th August, 1938.
Lieutenant-Colonel H. K. Rowntree, M.C., 22nd September, 1938.

RELINQUISHMENT

On the expiry of his tenure of office, Lieutenant-Colonel W. M. Will will relinquish his post as Assistant Director-General, I. M. S. (Stores), with effect from the forenoon of the 28th October, 1938, and proceed to Bombay to assume charge of the Government Medical Store Depôt, Bombay.

Lieutenant (on probation) G. K. Beatty relinquishes his probationary appointment, with effect from the 2nd August, 1938.

RESIGNATION

Captain C. L. Ash resigns his commission, with effect from the 26th June, 1938.

DISCHARGED

Captain A. G. Khan from 26th August, 1938, for ill health.

Notes

HISTIDIN AND VITAMIN C

LATELY, Bauke published a résumé of his experiences during a period of three years with Larostidin-Redoxon therapy in 120 cases of peptic ulcer. The treatment of all these patients consisted of two courses of 20 to 25 injections of Larostidin 'Roche' in which 50 to 100 mg. of Redoxon 'Roche', a vitamin-C preparation, per ampoule were dissolved.

The results of this therapy were scrupulously controlled; only cases in which cicatrization could be proved by means of *x*-rays were considered as cured. The presented statistics read as follows: 35 per cent of all patients were cured after the first course of treatment, 35 per cent after the second, and the remainder, about one-third of all cases, experienced relief of the acute ulcer syndrome such as bleeding, emaciation, anæmia, etc., cicatrization however did not occur.

Bauke concludes from his observations that the Larostidin-Redoxon treatment is superior to the other forms of therapy, but that it is not always able to replace surgical treatment. In these refractory cases, in which it is necessary to resort to surgery, the submission of the patients pre- and post-operatively to a Larostidin-Redoxon course is recommended in order to ensure favourable conditions during the operation and to prevent relapses. In all these cases, at least for a period of two months after the treatment, alcohol, nicotine, pungent condiments, etc., should strictly be avoided.

SHORT-WAVE DIATHERMY

WE have received a small brochure on the subject of short-wave therapy from Messrs. Malgham Bros. of Bombay (26, Old Custom House Road) which they will send to any practitioner interested in the subject, on request.

Short-wave diathermy differs from conventional diathermy. With conventional diathermy, the current passes directly to the part under treatment through electrodes in direct contact with the body. With short-wave diathermy, electrode contact with the body is not necessary, obviating a direct flow of conductive current from the electrode to the part being treated. Treatment consists of bringing the body or part, not into intimate contact with electrodes but into a so-called field between highly insulated electrodes. How this field is produced and the various methods of application are described in the brochure. The term 'ultra-short' is sometimes applied to wave lengths less than 10 metres.

Short-wave diathermy, in contrast to conventional diathermy, has the advantage of more uniformly heating the protected and isolated tissue; insulated electrodes are used, which do not require intimate contact; the danger of burns is reduced to the minimum and can be obviated by proper technique. In brief, short-wave diathermy is a distinct advance, with few exceptions affording everything attainable by conventional diathermy and permitting applications wholly impossible with the older method.

This brochure gives the theory and practice of short-wave therapy and clinical suggestions for the treatment of certain specific conditions. It provides interesting and very informative reading.

ILFEX *X*-RAY FILMS

WE have received from Messrs. Ilford, Limited, a pack of Ilfex *x*-ray films with a request that we should test them.

These films were used in the *x*-ray department of the Carmichael Hospital for Tropical Diseases attached to the Calcutta School of Tropical Medicine, and gave complete satisfaction in every way. The films were used without an intensifying screen. They gave fine detail, the contrast was good, and the exposure time was short.

We have no hesitation in recommending these films.

Publishers' Notice

SCIENTIFIC Articles and Notes of interest to the profession in India are solicited. Contributors of Original Articles are entitled to receive 25 reprints *gratis;* additional reprints can be obtained on payment. No reprints will be supplied unless contributors *ask for them at the time of submitting their manuscripts.*

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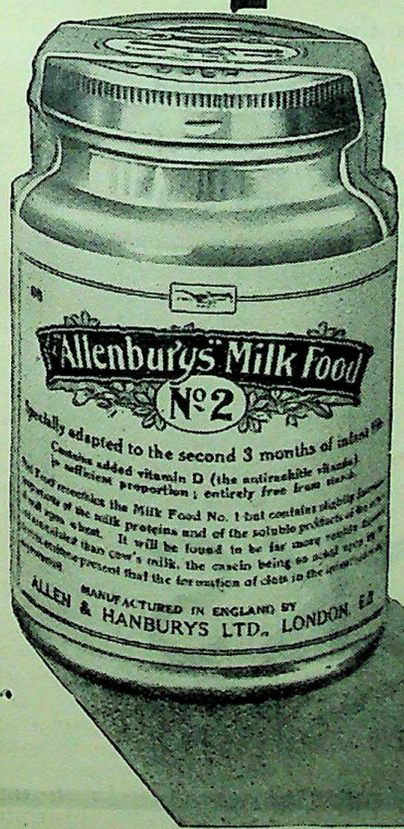
As Development Proceeds



The needs of the growing infant call for increased amounts of mineral elements; these, with small variations in the proportions of fat, protein and soluble sugars, form the *raison d'ètre* for the use of "Allenburys" No. 2 Humanised Milk Food instead of "Allenburys" Milk Food No. 1 from the beginning of the fourth month.

Descriptive literature will be sent on request.

Allen & Hanburys Ltd.
(Incorporated in England)
Clive Buildings,
CALCUTTA

And at 37 Lombard Street, London, E.C.3

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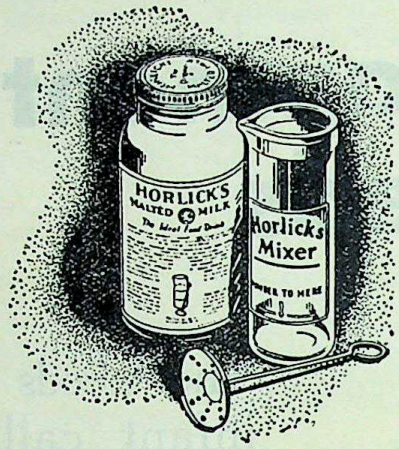

CLINICAL experience shows that Horlicks gives excellent results in all conditions associated with under-nutrition and in which tissue-rebuilding is necessary.

Horlicks—full cream cows' milk combined with the nutritive extracts of malted barley and wheat—provides the patient with first class protein and the easily digested and rapidly assimilated protein-sparers, lactose, maltose and dextrin. Fifteen per cent of the caloric value of Horlicks is derived from protein, much of it in a form ready for direct assimilation.

A feature of physiological tests with Horlicks was the short time between ingestion and utilization.

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Original Articles

FOLLOW-UP OF A MASS TREATMENT WITH INJECTABLE ATEBRIN

By A. T. W. SIMEONS, M.D. (Heidelberg)
Bombay

IN March 1936 (*Indian Medical Gazette*) I reported on a 'blanket' treatment for malaria covering a mill area in the Southern Deccan with a total population of 5,600 souls, all of whom received two injections of atebrin. The two injections were followed up by 0.01 g. plasmochin simplex on three consecutive days. No further treatment was given. The district was highly malarious and at the time of the mass treatment, which was completed in nine days, the malaria incidence was of epidemic magnitude.

The relapse rate for the following six months was given in the paper and appeared surprisingly low. Similar experiments carried out during the Ceylon epidemic of 1935 on a much smaller scale, and not so carefully controlled, showed equally satisfactory results, and it was therefore very fortunate that in the mill area results could be carefully watched over a period of 2½ years. The measures adopted after the 'blanket' treatment were as follows :—

(1) Intensive propaganda was carried on in the village to bring every fever case to the doctor. This propaganda was successful because the villagers all knew that two painless injections would bring instant relief of all symptoms of malaria. 'Every concealed fever case is a menace to all; every concealed case might make them all as ill as they were before the treatment, etc.'

(2) Every new case of malaria was treated at once with two injections of atebrin (no plasmochin).

(3) No quinine whatsoever was dispensed.

(4) Simple anti-larval measures, such as oiling of pools in the river-bed during the dry season, were done, the local carrier being *Anopheles culicifacies*.

The chart gives the monthly malaria incidence for 2½ years prior to and 2½ years after the 'blanket' treatment. In the second half of the chart the black part of the blocks represents the number of re-injections, and the white part the number of injected new-comers, including a few cases from outside villages which have availed themselves of the mill dispensary. The black and white parts together give the total number of cases treated every month.

In the chart every re-injection has been registered as a 'relapse' although obviously a large number of these so-called 'relapses' are reinfections, particularly as it was noticed that most of these 'relapses' occurred after leave to the native village. But even leaving this point aside and registering all re-injections as relapses, the results are much better than clinical experience would lead one to expect, and if it is borne in mind that these figures are from a population including women and children varying around 6,000 souls, malaria can no longer be considered highly endemic, as it was for 15 years preceding the mass treatment for which reliable records exist. In fact the relapse rate is so surprisingly low that some sort of explanation of this phenomenon must be attempted.

It may be argued that the benign tertian strain in this particular area was an unusually benign one and exceptionally sensitive to atebrin; that the rainfall in the years following the mass treatment was particularly unfavourable for the propagation of *A. culicifacies;* that the simple anti-larval measures were unusually effective; and, finally, that owing to the excellent social welfare amenities provided by the mill management, the general condition of the population was particularly good. But even taking these points into consideration the results at Gokak seem so surprisingly satisfactory that there is still room for a more sweeping explanation. Perhaps the following observations may prove helpful.

In private practice in Bombay I see many cases of *fresh* malaria picked up from all parts of India, and having seen the excellent results of parenteral atebrin in Ceylon and Gokak I applied the same abbreviated method in these cases. The immediate clinical results were just as favourable but the relapse rate was practically 100 per cent within one to six weeks. It was therefore soon decided to follow up the two injections with a full course of tablets, followed by a full course of plasmochin, so as to get the almost immediate clinical response attainable with injections and the satisfactory relapse rate of the oral method combined. The results of this method were better but by no means as satisfactory as I have been accustomed to see with tablets only. I therefore returned to treating fresh infections by the oral method only, and relapses again became the exception instead of the rule.

The above observations on first infections are unfortunately not based on a large series of experiments; they were made on cases as they occurred in the routine of private practice. The conclusions drawn from them may therefore be misleading, but the discrepancy between sporadic first infections and epidemic malaria has struck me so forcibly that I feel justified in attempting an explanation, which may lead to further investigations by workers more fortunately placed.

Thus, further experience with injectable atebrin has led to two seemingly contradictory results.

In the highly endemic or epidemic areas in which it has been tried, the abbreviated two-injection method yields excellent results, whereas in sporadic first or fresh infections it is a hopeless failure. Particularly the observation that the combined parenteral and oral method gives

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less satisfactory results than the oral method alone in fresh cases, whereas the injections alone seem to be sufficient in epidemic malaria, points strongly to an immunological factor.

It appears that immunity in malaria may be considered a sort of balance between resistance and intensity of infection. In first infections therefore the 'infection scale' is loaded and the 'resistance scale' is empty. On the other hand in persons residing in endemic areas both scales are heavily loaded and, as no treatment can completely eliminate all parasites from the body, first infections treated energetically from the onset will always have a balance in favour of the infection. This will result in a high relapse rate because the body has had no time to build up any resistance. If on the other hand the vast majority of parasites are suddenly destroyed in a case residing in an endemic or epidemic area, the balance will turn in favour of the previously acquired immunity and a low relapse rate result, even after an abbreviated treatment which would be utterly inadequate in a fresh case.

Moreover, it has frequently been observed, and was again seen during the Ceylon epidemic, that 3 to 10 days after the parasites had been removed from the peripheral circulation with atebrin, they again appeared for several days without producing any clinical symptoms and disappeared spontaneously without any treatment. I have never seen this in first infections treated at the onset of fever, where reappearance of parasites always seems to indicate a pending relapse, indicating that the final clearing of the body can only take place in the presence of a high immunity, which easily outweighs the mild infection remaining after treatment with atebrin.

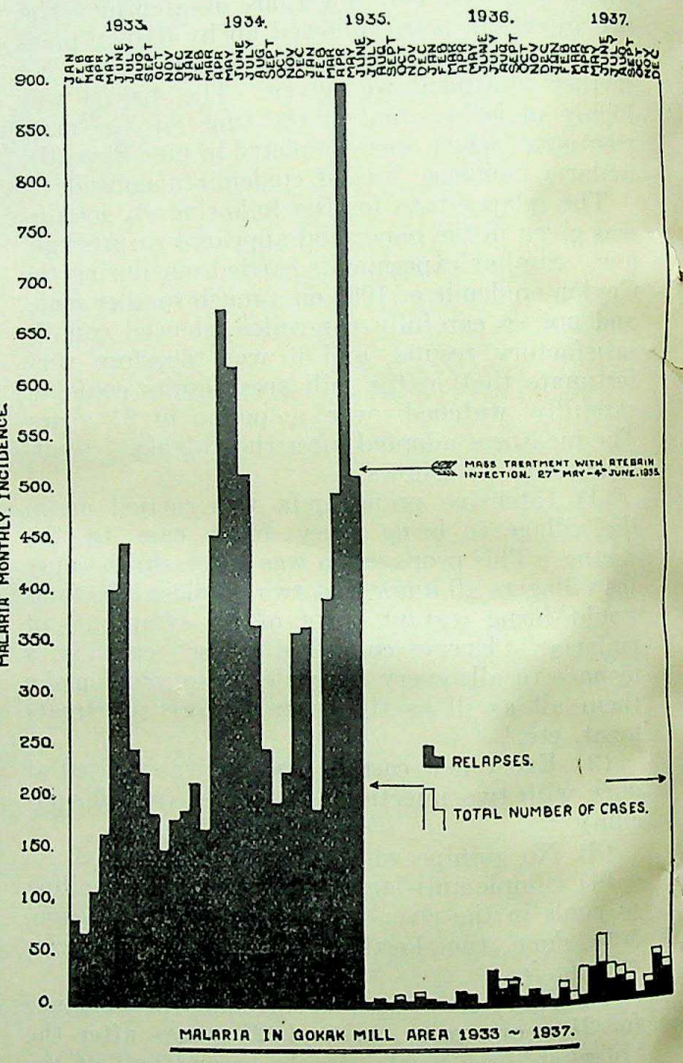
Some hold that a first infection should not be treated at once with a powerful parasiticide like atebrin, others are convinced that oral atebrin does not impair the development of a resistance. While I am inclined to agree with the latter I am most emphatically of opinion that atebrin musonate, through its quick and powerful action in fresh cases, reduces the parasite count so suddenly that the body is no longer called upon to produce an immunity, and hence an unchecked multiplication of parasites recommences and ultimately results in a clinical relapse.

Exactly why atebrin tablets do not appear to interfere with the development of resistance in fresh cases, while injections obviously do, is a problem outside the scope of this paper. It can only be said at present that it has nothing to do with the quantity of atebrin given, as injections *plus* tablets appear to obstruct immunity to a greater extent than tablets only. If a high degree of resistance to superinfection has been attained through years of exposure the body appears to become quite capable of coping with the few parasites remaining alive after treatment or introduced by a mild reinfection. This I venture to suggest may be an explanation why the 'relapse rate' or susceptibility to reinfection at Gokak as shown in the chart seems to be very slowly increasing, as resistance becomes less.

What I have hitherto experienced with atebrin musonate has led me to adopt the following principles :—

(1) In first infections that are seen from the onset of fever—tablets only, followed by plasmochin, have given me the lowest relapse rate (although clinical relief is not as prompt as with injections).

(2) In first infections that are seen after several rigors, injections are only used if cerebral or circulatory symptoms call for very prompt action. In these cases I have found it best to give no further treatment after two injections, to wait for the next relapse, and treat this with tablets and plasmochin. All other cases are treated with tablets only, followed by plasmochin.



MALARIA IN GOKAK MILL AREA 1933 ~ 1937.

(3) In chronic relapsing cases living in non-endemic areas either injections or tablets may be given, followed up by plasmochin.

(4) In malaria cases residing in endemic areas or during epidemics, and therefore having a high immunity, two injections only are the

(*Continued at foot of opposite page*)

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ENUMERATIVE STUDIES IN BENIGN TERTIAN MALARIA

By V. SIVALINGAM, M.R.C.P. (Edin.), D.T.M. & H. (Eng.)

Medical Laboratories, Colombo, Ceylon

THE observations recorded in this paper were made at the Government Hospital at Watawala from December 1935 onwards. The great 1934-35 epidemic had affected the population served by this hospital. The intensity of the epidemic had waned by the end of the year 1935. Being a non-malarious district, the people had their first malaria attack during the epidemic. Thus, the cases investigated were those having subsequent attacks consequent to infection in the epidemic, and those who having escaped the epidemic itself were suffering from their first malarial attack later. Thus the cases are easily grouped into 'subsequent' and 'primary', respectively, from the histories. The hospital is situated at an altitude of 3,200 feet above sea level and the sick were drawn from places 800 to 2,000 feet above sea level.

The method

Patients were admitted and inquiry made into the previous malaria history; they were grouped into 'primary' and 'subsequent' cases. A primary case is one of less than two weeks' duration; while cases that had recurrent periods of illness alternating with periods of freedom from fever and had lasted for more than two weeks for the whole illness were considered subsequent; these were relapses and reinfections. No anti-malarial treatment was given. The blood was examined in both thin and thick smears for diagnosis, and the patient was watched until there was one or more paroxysms of fever. The time of onset of fever or rigor was noted and two-hourly temperature charts were kept. Then a few hours before the next anticipated paroxysm blood was secured for enumeration and for a thin smear examination. The fowl-corpuscle suspension method, as advocated by Sinton (1924), was used for the enumeration. The thin smear was examined and the different stages of the parasites were recorded. The temperature at the time of taking the blood sample was also noted, and the highest temperature attained in the subsequent paroxysm was recorded. The fowl-corpuscle suspension used contained 10,400 cells per c.mm.; one thousand fowl cells were counted in the majority of the cases.

A. *Counts in primary and subsequent attacks*

The primary cases generally gave much higher counts, with a few exceptions. The distribution according to numerical values is shown in table I.

TABLE I

Number of parasites per c.mm. finger blood	Primary cases		Subsequent cases	
	Number	Percentage	Number	Percentage
Under 5,000 ..	7	32	13	47
5,000 to 10,000	2	9	7	25
10,000 to 20,000	9	41	5	18
Over 20,000 ..	4	18	3	10
TOTAL ..	22	..	28	..

It is seen that over 70 per cent of the subsequent cases showed parasite values under 10,000 whereas about 60 per cent of the primary cases showed values above this.

Sinton *et al.* (1931) investigated 54 cases of chronic infections with *P. vivax* among adult British soldiers. They divided their cases into three groups—the 'prepyrexial', the 'interpyrexial' and 'pyrexial'. Their inter-pyrexial group consisted of 11 patients and the counts in eight of these lay between 3,000 and 5,000 per c.mm. One low count (1,960) followed a pyrexia of only 99°F., while the other two were 8,000 and 9,240, respectively. This group is comparable with the cases under review, since in the majority of these the enumerations were done in the inter-pyrexial period.

Ross and Thomson (1910) made a series of counts on eight *P. vivax* cases infected in

(*Continued from previous page*)

method of choice. The results, both immediate clinical relief and relapse rate, appear to be very satisfactory, while, where large numbers of patients have to be dealt with in a minimum of time by a short-handed staff, it is technically the only possible method of rational treatment.

There is ample opportunity for experiments with the injection method of 'blanket' treatment in India, which if carefully conducted would possibly further our knowledge of how to cope with and suppress epidemics without attaching too much importance to expensive, seldom adequate and never-ceasing anti-larval vigilance.

Summary

(1) Two and a half years' observation of malaria incidence in a highly endemic mill area, in which a 'blanket' treatment had been carried out with two injections of atebrin per inhabitant, showed a satisfactory result.

(2) This treatment in fresh infections gave an unsatisfactory result.

(3) Fresh cases treated with two injections at onset followed by a full course of atebrin tablets and plasmochin have a higher relapse rate than first infections treated with tablets only.

(4) An immunological explanation for this phenomenon is attempted.

(5) An immunological grouping of cases is suggested and the treatment for each group outlined.

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West Africa or America and none was of less than some weeks' duration when admitted into hospital in Liverpool. Among the cases there is only one count in the inter-pyrexial interval and this is comparable to the cases listed in this paper. This case showed 9,600 parasites per c.mm. of blood.

It is therefore suggested that 10,000 parasites per c.mm. of finger blood be taken as the upper range for parasite prevalence in the majority of the 'subsequent' cases one would encounter.

B. *Relationship of parasite numbers to degree of fever*

In table II, the counts are tabulated according to temperatures. These temperatures are the highest reached at the paroxysm next to the enumeration. Hence the fever attained would depend on the parasites present; and, of these, the matured stages alone would be responsible. Tables III (*a*) and III (*b*) show the analysis of the stages of the parasites found in the thin films taken simultaneously with the specimens for counts. It will be seen that every case that had fever, with the exception of cases 6 and 10 among primary infections and cases 11, 13, 15 and 19 among subsequent attacks, showed trophozoite stages also. The ring forms present are considered to be due to the initiation of the paroxysms described in this paper, as it is well known that sporulation starts some time before the onset of the fever. These trophozoites are the precursors of the schizonts that would give rise to the paroxysms following the ones recorded here. It was noted that it was rarely indeed that parasites could be found in one stage only in benign tertian infection. The tables also show that fever is of quotidian type, both in the primary and subsequent cases and the exceptions are few.

TABLE II

Relationship between parasite counts and temperatures

Temperature, °F.	Parasite counts	
	Primary cases	Subsequent cases
99.0	930	940
		3,300
99.5	7,770	1,000
		5,390
100.0	..	1,760
		4,170
101.0	..	547
101.5	..	6,630
102.0	1,520	..
102.5	14,100	900
103.0	4,550	780
		4,360
103.5	20,800	..
	9,200	
104.0	15,400	22,600
		10,400
104.5	17,330	8,730
	17,650	17,000
		10,700
105.0	13,660	10,100
	24,800	6,400
	11,000	14,600
	13,200	..
105.5	20,800	6,350
	20,800	..
	28,450	..
	15,670	..
106.0	9,850	22,290 (over 105.6°F.)

TABLE III (*a*)

Showing stages of parasites in blood at time of count

Primary cases

Case number	Rings	Trophozoites	Schizonts	Rosettes	Gametocytes	Type of fever
1	+	+	+	..	+	Quotidian.
2	+	+	+	..	+	"
3	..	+	..	..	+	Irregular.
4	..	+	+	..	..	No fever.
5	..	+	+	+	+	Quotidian.
6	..	..	+	..	+	Tertian.
7	+	+	+	+	..	Quotidian.
8	..	+	+	..	+	"
9	..	+	+	..	..	"
10	+	..	+	+	..	"
11	+	+	+	..	+	"
12	+	+	+	..	+	"
13	..	+	+	..	..	"
14	+	+	+	..	+	Quotidian.
15	..	+	+	..	+	..
16	+	+	..	..	+	No fever.
17	..	..	..	..	+	Quotidian.
18	..	+	+	..	..	"
19	+	+	+	..	..	"
20	+	+	+	..	..	No fever.
21	..	+	..	..	..	Quotidian.
22	+	+	+	..	+	

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TABLE III (*b*)

Subsequent cases

Case number	Rings	Trophozoites	Schizonts	Rosettes	Gametocytes	Type of fever
1	+	+	+	..	+	Quotidian.
2	..	Not done.	..	..	+	Tertian.
3			..	..	..	Quotidian.
4	+	+	..	..	..	..
5	..	+	..	..	..	Quotidian.
6	+	+	..	..	..	,,
7	..	+	+	..	+	Tertian.
8	+	+	+	+	+	Quotidian.
9	+	+	+	+	+	,,
10	..	..	..	..	..	No fever.
11		Parasites not seen in the thin film.			..	Irregular.
12	+	+	..	..	..	Quotidian.
13	..	..	+	..	..	,,
14	+	+	..	..	+	,,
15	+	..	+	+	+	,,
16	+	+	+	..	+	,,
17	..	+	+	..	+	,,
18	..	+	..	..	+	Tertian.
19	+	..	..	..	..	,,
20	+	+	+	..	+	Quotidian.
21	..	+	+	+	+	,,
22	+	+	..	..	+	,,
23	..	+	..	..	+	Irregular.
24	+	+	..	..	..	No fever.
25	..	+	..	..	+	Tertian.
26	..	+	+	..	+	Quotidian.
27	+	..	..	..	..	No fever.
28	+	+	+	..	+	..

Among primary cases there would seem to be a correlation between the parasite counts and the degree of fever among different persons. The higher temperatures were, generally, found in the cases that had higher counts. No such relationship was found among the subsequent cases. The higher temperatures were as often produced by smaller numbers of parasites as they were by larger numbers.

Ross and Thomson (*loc. cit.*) found in their cases, except four without fever, a very strong, almost convincing, correlation.

Lowe (1934) investigated 37 cases of *P. vivax* infection which had had no malaria for at least one year previously and three cases of relapses. 'The results show that in infections with *P. vivax* the relation between the number of parasites and the degree of fever in different patients is not marked. Those patients with the highest counts sometimes tend to show the greatest degree of fever but there are many exceptions to this general tendency'.

Knowles and Das Gupta (1931) studied 15 cases. These were of the endemic, chronic or 'residual' type. They state that 'whilst it is generally true that high counts are associated with high temperatures, yet the correlation is only a rough one. Our evidence goes to show that in established, chronic and 'residual' infections the patients may be febrile with much lower counts. On the other hand, he may show a high parasite count when the temperature is almost normal'.

Sinton *et al.* (*loc. cit.*) consider that 'the highest temperatures recorded to occur chiefly with the high parasite counts'. Their cases were chronic benign tertian infections.

C. *The pyrogenic limit*

The attempt was made to determine the minimum number of parasites that was necessary to produce fever. The cases that did not develop fever subsequent to the counts are shown in table IV.

TABLE IV

Benign tertian

		Primary attack	Subsequent attack
Case	4	500 parasites per c.mm. of blood.	3,100 parasites per c.mm. of blood.
,,	11	1,500 ,, ,, ,,	410 ,, ,, ,,
		3,000 ,, ,, ,,	1,670 ,, ,, ,,
		230 ,, ,, ,,	700 ,, ,, ,,
,,	17	1,120 ,, ,, ,,	400 ,, ,, ,,
,,	21		387 ,, ,, ,,
,,	24		215 ,, ,, ,,
,,	27		
,,	28		

The lowest counts that have produced fever were found to be 930 among primary cases and 547 among the subsequent cases. In the former, rings, trophozoites and gametocytes and no

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schizonts were found on two occasions blood films were examined [case 16, table III (*a*)], and in the latter there were ring, trophozoite, schizont and gametocyte stages [case 28, table III (*b*)].

Therefore, it appears that on an average a total of about 900 parasites are necessary to produce fever in primary attacks and for subsequent attacks about 500 parasites are sufficient.

According to Ross and Thomson (*loc. cit.*) 'about 200 to 500 may perhaps be taken as the usual limit'. 'The actual limit above which they become pyrogenic probably varies in different cases'. The cases studied by these observers, as pointed out before, were of some weeks' duration and would come under the subsequent group of this paper.

Therefore, it is suggested that, in persons not attacked by malaria before, the natural resistance towards invasion of the body by parasites is great and that a larger number of organisms is necessary to produce a break-down of this resistance, resulting in the first attack of malaria.

D. *Do mature forms of* P. vivax *retire to internal organs?*

Sinton *et al.* (*loc. cit.*) are of opinion that 'it seems probable that blood cells infested with mature parasites are more liable to accumulate in the internal organs than cells with young forms'.

Lowe (*loc. cit.*) in dealing with the parasite count in the interval between the rigors says that 'in the literature of malaria we have found no evidence which proves that *P. vivax* disappears from the peripheral blood into the internal organs on approaching maturity. The present findings suggest that they may occur, but it cannot explain entirely the marked diminution in the parasites that is found in every case in the apyrexial period between the rigors'.

A reference to tables III (*a*) and (*b*) in this paper reveals that in cases 3 and 16 in the former and cases 2, 5, 6, 12, 14, 18, 19, 22, 23 and 25 in the latter, there was an absence of the maturer forms of the parasite, namely schizonts, though fever was present in that developmental cycle. The thin films were thoroughly searched to establish the presence of these forms but without success. If maturer forms are present in the peripheral blood in a representative manner, then it is natural to expect to find them readily in the films examined. The failure to find them in the cases noted is considered satisfactory evidence that they have receded into the internal circulation.

E. *Induced malaria*

Observations on the numerical prevalence of parasites in inoculated malaria among general paralytics have been made by many workers. Thus Korteweg (1924), Rudolf (1924), Pijper and Russell (1925), and Grant and Silverston (1926) have described their findings. But it is now well recognized that malaria produced by blood inoculation is not comparable to natural malaria. James (Thomson, 1930) who has had extensive experience in therapeutic malaria affirms that 'malaria caused by direct blood inoculation is a different disease from malaria caused by mosquito bites'.

Further, even malaria induced by bites of infected mosquitoes appears to behave differently from that acquired in the open country. For it has been shown (Yorke and Macfie, 1924) that malaria induced by this method in the treatment of general paralytics responds readily to quinine and a short course with that drug produces a complete cure. Whereas, it is the experience in ordinary practice that naturally acquired malaria is not so readily curable.

Therefore it is considered that the numerical prevalence of parasites in these different groups of malarial fevers is not comparable for the purposes of this paper.

Summary and conclusions

1. Fifty cases of benign tertian infection were studied by the numerical method. They were grouped into primary and 'subsequent' cases and numbered 22 and 28 respectively.

2. It was found that the counts in primary attacks were generally higher than in subsequent attacks. It is considered that 10,000 parasites per c.mm. is possibly the upper limit of the majority of subsequent attacks.

3. Among primary cases a correlation between the parasite counts and the degree of fever among different persons was found to be present. But no such relationship was seen among the subsequent cases.

4. As regards the fever threshold, about 900 parasites are found to be necessary to produce fever in primary attacks, and for subsequent attacks about 500 parasites are sufficient.

5. Evidence is adduced to show that in *P. vivax* infections, maturer stages of the parasite tend to migrate into the internal circulation.

Acknowledgment

I am thankful to Dr. W. E. de Silva, Acting Director of Medical and Sanitary Services, for kindly granting permission to publish this paper.

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APPENDIX I

Protocols of primary cases

Number	Sex	Age (years)	Duration of illness (days)	Spleen	Liver	Enumeration: Parasites per c.mm. As = Asexual S = Sexual	Enumeration: Temperature, °F., when blood was taken	Highest temperature at next paroxysm, °F.
1	M.	28	6	+++T	0	(1) 20,800	96.8	103.4
						(2) 20,800	96.4	105.4
2	M.	32	8	0	0	4,550	96.4	103.2
3	F.	26	6	0	0	14,100	97.0	102.4
4	F.	25	6	..	..	500	97.0	Normal
5	M.	8	8	0	+T	20,800	99.0	105.4
6	M.	14	8	0	0	As 1,520 S 35	97.4	101.8
7	F.	10	4	P	0	9,200	98.6	103.6
8	M.	36	5	0	0	17,330	97.0	104.6
9	F.	28	6	P	..	13,660	97.8	104.8
10	F.	7	2	0	0	28,450	98.4	105.4
11	F.	45	5	0	0	(1) As 7,770 S 80	97.0	99.4
						(2) As 1,500 S 25	97.0	Normal
						(3) As 3,000 S 60	Normal	"
12	M.	30	3	0	0	15,670	97.0	105.4
13	M.	22	4	+T	0	13,200	98.0	105.2
14	F.	28	4	+T	+T	As 24,800 S 200	104.8	104.8
15	F.	17	12	P	0	As 17,650 S 370	97.6	104.6
16	F.	10	3	0	0	As 930 S 50	97.0	99.0
17	M.	25	8	P and T	0	As 230 S 70	97.0	Normal
18	M.	16	5	0	0	As 9,850 S 30	100.2	106.0
19	M.	11	10	++T	0	As 11,000 S 50	98.4	105.2
20	F.	25	6	+	0	15,400	99.2	104.2
21	M.	40	10	P and T	0	1,120	98.4	Normal
22	M.	28	10	+T	0	18,520	97.0	Fever *

T = Tender. P = Palpable.

* Highest temperature not recorded as fever occurred at night.

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THE USE OF COBRA VENOM IN NERVE LEPROSY

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THE reverence with which the average Hindu regards a snake is well known. In the Hindu mythology, *Shesh Nag* is believed to have protected God Brahma, and God Shiva gave the mark of Omega on the hood of the cobra. Shiva is depicted with snakes coiling around his neck and a snake emerging from the tuft of his hair. The snake is an emblem of the mystery of death, as well as of healing. If a snake is killed by a person there is a belief that the snake-god takes revenge on the culprit by inflicting leprosy on him at once, or in some future incarnation. Since according to mythology leprosy is a disease given in the form of a punishment to the culprit, the snake is believed to avoid biting a leper. If it does bite a leper his disease is believed to be cured at once. In the indigenous medicine, cobra venom is said to have been used with success in the treatment of leprosy. Ainslie (1826) mentioned the use of dried flesh of the harmless south Indian hill snakes, known as *Tamool* or *Malay pamboo*, in Hindu medicine, as a remedy against 'kustom' or leprosy. The

(*Continued from previous page*)

APPENDIX II

Protocols of subsequent cases

Number	Sex	Age (years)	Duration of illness (months)	Spleen	Liver	Enumeration: Parasites per c.mm. As = Asexual S = Sexual	Enumeration: Temperature, °F., when blood was taken	Highest temperature at next paroxysm, °F.
1	M.	25	8	++	0	6,400	99.0	105.0
2	F.	30	12	..	..	1,000	99.0	99.4
3	M.	35	12	..	..	10,700	101.0	104.8
4	M.	25	3	+	0	3,100	97.0	98.0
5	M.	62	1	0	0	1,760	97.2	100.0
6	M.	14	Months	+++	+ T	6,630	99.6	101.6
7	F.	19	,,	..	..	900	97.0	102.6
8	M.	24	11	0	0	17,000	99.6	104.6
9	M.	17	8	0	0	74,100	105.4	105.4
10	F.	10	6	0	0	410	97.0	Normal
11	M.	15	8	++++	+	As 940 S 10	98.0	99.0
12	M.	23	8	++	++	As 8,730 S 90	99.4	104.4
13	M.	30	3	++	+ T	As 780 S 50	98.0	103.1
14	M.	30	3	0	0	As 6,350 S 240	99.0	105.4
15	M.	20	3	0	0	As 10,400 S 120	100.2	104.0
16	M.	30	3	P	0	14,600	98.6	105.0
17	M.	18	Months	0	0	10,100	98.0	105.0
18	M.	18	12	0	0	22,290	99.4	105.6 *
19	M.	23	12	0	0	(1) 3,300 (2) 410	97.0 97.0	99.0 Treatment started.
20	M.	22	1	0	T	22,600	97.0	104.0
21	M.	22	3	0	0	4,360	98.4	103.2
22	M.	29	10	0	0	4,170	99.0	100.0
23	M.	22	Months	0	0	7,000	97.0	Fever *
24	M.	45	3	0	0	(1) 1,670 (2) 700	97.0 97.4	Normal ,,
25	M.	30	1	0	0	5,390	97.8	99.4
26	F.	45	7	0	0	9,890	98.0	Fever *
27	F.	12	1	++	0	(1) 400 (2) 387	97.0 98.0	Normal ,,
28	F.	20	8	P	0	(1) 547 (2) 215	97.0 98.4	101.0 Normal

* Fever in early hours of morning and hence highest temperature unrecordable.

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blood of snakes has been used in the Mohammedan medicine as a local application in leucoderma which is believed to be a form of white leprosy. In Northern India the flesh of the cobra mixed with arsenic has been used as an external application in syphilitic rashes and other skin diseases.

Monaelesser reported that a leper suffering from plexus-neuritis felt great relief after being bitten by a large tropical spider. Labernadie (1934) and Brambilla (1935) also remarked on the beneficial effects of cobra venom in neurosyphilis, meta-syphilitic rashes, and neuroleprosy. In Brazil the rattlesnake venom is believed to be very efficacious in leprosy and in the Butantan Institute of Serum Therapy experiments are said to be in progress in this connection.

Cobra venom in nerve leprosy

During the last few years the present authors (1937) have been carrying on experiments in connection with the therapeutic uses of cobra venom and have made references to the possibilities of its being a useful agent in the treatment of leprosy, particularly of the nerve type. Lowe (1938) reports that, in India, leprosy is commonly of neuromacular or tuberculoid type. This class includes the 'macular' and their acroteric, or 'tropho-anæsthetic' varieties. In his opinion in both these types, wherever the lesion occurs, in the skin, in the cutaneous nerves, or in the nerve trunks, there occur granulomatous changes of a tuberculoid nature. It is possible that all the active 'neural' types of leprosy may be essentially tuberculoid in nature. Muir (1936-1937) reported that confinement of infection to one or more nerves is to be taken as a sign of high resistance on the part of the patient and in such cases it may remain stationary for years. In India more than half the leprosy cases belong to the resistant type of nerve leprosy. In all these cases the most important factor is the restoration and steady maintenance of high standard of health to keep the patient free from pains.

Cobra venom has already found a place in the treatment of neuritis. Macht (1936) showed that it has marked analgesic effect when injected intramuscularly, and the sensitiveness of the nerves to pain as produced by electric current is greatly diminished. The same author has further observed that its action on the pain centre in the cerebrum is not unlike that of morphine but differs from it in being slow to appear and is more lasting in effect. It does not induce sleep in the same way as that alkaloid.

Action of cobra venom on leprous tissues

The structure of a leproma when grown in tissue culture was described by Timofejewsky (1930). When a fragment from a leprous nodule is planted in heparinized plasma of both man and rabbits with human embryonic extract, the fibroblasts grow well generally in the first week, and there is also an excess of macrophages with *Mycobacterium leprœ* in them even during the second and third weeks of growth. No *M. leprœ* are seen in the fibroblasts and they do not seem to affect the growth of the tissue explant. They apparently have no toxic effect on the fibroblasts.

Henderson (1931) described the histology of a leprous nodule and considered it as a focus for the acid-fast bacilli in the endothelial cells lining the capillaries at the site of the embolism; there is œdema of the surrounding skin elements, acid-fast bacilli occur in the dilated lymph spaces and in the phagocytes (histiocytes). In the developed nodules the multinucleated giant cells are found to be uncommon. White (1931) showed that when cobra venom was injected into aseptic tissue spaces, no protective granulation tissue developed around the irritant substances. It was observed that cobra venom rather destroyed or prevented the growth of the new granulation tissue. Is it possible that a similar action may take place inside a leprous nodule? It is well known that tuberculoids have a tendency sometimes to central necrosis and caseation. Since cobra venom has the power of tissue digestion, if it is made to reach the interior of the tuberculoid, either by local or parenteral injections, it is possible that it may help in the dissolution of these growths.

Chopra, Das and Mukherjee (1936) showed that in dilutions such as 1-60,000 to 1-80,000 cobra venom stimulated the growth of tissue culture cells, but with higher concentrations, *e.g.*, 1-20,000, the venom produced a rapid destruction of the growing cells. The possibility that local injections of the venom into leprous nodules may help in their dissolution has thus a rational basis. It cannot be said, however, at this stage whether cobra venom has any effect on *M. leprœ* or not. Clinical observations show that a slight but a distinct reduction of the size of nodules and macules does occur. Improvement in the sensation of the anæsthetic patches has also been observed after the use of the venom for two or three months.

M. leprœ has a fatty capsule around it. It is possible that cobra venom may be able to dissolve this capsule and thus may even be able to act on the *M. leprœ* itself. The venom has been shown to have an affinity towards dissolving the fatty and cephaline tissues, but to anticipate such reactions from it in leprosy needs further work. Chaulmoogra oil is believed to possess a lipase which acts on *M. leprœ* by dissolving its waxy capsule. If such action be at all possible, cobra venom may possibly supplement the action of the chaulmoogra oil in the treatment of leprosy. This paper has been written only to bring before the readers the possible application of snake venoms in nerve lesions of lepers. Only after an extensive trial of the venom in all types of cases of leprosy will it be possible to form an opinion whether cobra venom has any value in this disease. It has already been mentioned that the majority of the cases in

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India are of the nerve type and since the venom has a special affinity for nerve tissues, its possible utility should be investigated.

Through the courtesy of Dr. Lowe we have carried out trials on a small series of patients in the Leprosy Department of the School of Tropical Medicine, Calcutta, but these are not sufficient to draw any definite conclusions. More extensive work in this connection is being carried out in some of the leprosy clinics outside. In this paper we give the results obtained in a small series.

Analysis of the cases treated

Cobra venom is being tried in all three forms of leprosy. Injectable cobra venom was distributed to various leprosy hospitals and the results obtained from some of them are given below. Everyone who tried cobra venom reported that there was a good deal of relief in the shooting character of the pain in almost every case of leprosy of the nerve type. In about 6 per cent only, there was little or no relief at all. It is curious that the patients who did not show any improvement with cobra venom did not show improvement with any other drugs either. We have personally observed marked relief of pain and general improvement in a number of nerve leprosy cases treated with cobra venom.

Injectable cobra venom was also used in the Chandkhuri Leprosy Hospital, Baitalpur, in Central Provinces, and the S. G. P. Mission Dispensary, Kagalnar Kolahapur. The present authors are grateful to the workers in the above institutions for kindly sending the details of their cases and their opinion regarding the efficacy of cobra venom in leprosy. Dr. Gass of Chandkhuri Leprosy Hospital, Baitalpur, has published his results in *Leprosy in India* (1938). He pointed out that cobra venom markedly relieves the sensation of pain and formication, and cobra venom injections have become very popular with his patients. In a number of cases, however, the relief was only temporary and in some patients there was no relief at all.

Miss Haythornthwaite of the Mission Dispensary, Kagalnar, has kindly sent us a report on 32 cases of leprosy. She observed marked and definite relief in 14 (43.7 per cent), some relief in 16 (50.0 per cent), and slight or no relief in 2 (6.3 per cent) patients (*see* table). The figures in the 4th column show the number of mouse units injected per dose every week. In some cases two courses were given, the second after an interval of three months. The patients were given intradermal injections of cobra venom once a week. Each dose was diluted with normal saline and injected by a number of punctures in the painful area. The injections were given only in cases where the pain was bad enough to interfere with sleep. The venom could not be injected more frequently as patients had to come from long distances, and some gave up the treatment of their own accord as they felt better and did not think it necessary to have further injections. In the majority of cases the improvement was marked. Some of them had been treated with other remedies for over a year without relief in the sensations of 'pins and needles' and formication. The venom was found to be particularly useful in giving prompt relief in cases of paraesthesia of early leprosy, the sensations generally returning to normal after a course of four to six injections. Marked relief was obtained in the severe aching pain from which patients suffered during the phases of the 'reaction period'. The relief of neuritis and of sensation, such as pin pricks, occurred from above downwards and the normal sensations also returned in the same order. In almost all patients relief was obtained with four to six injections. Two to three days after the first injection, the patient felt the improvement and after the second or third injection pain often disappeared altogether. The treated cases were mostly those on which other analgesics had been already tried without success. The criteria of the cure was that the patient reported that his pain had disappeared and he did not require any more injections.

The commonest nerves involved in order of frequency are the ulnar, peroneal, posterior tibial, and median. These nerves were thickened and painful in nearly all the patients in this series. The injections relieved the severe nerve pains due to lepra reaction. In some cases injections were given locally to relieve pain of a particular part of the body, which was interfering with the sleep of the patient.

Discussion

It had been suggested that relief of nerve pain and other nerve symptoms in leprosy, after cobra venom, is due to its choline-estrase-like action (Iyengar, Sehra, Mukerji and Chopra, 1938). In those suffering from severe and constant nerve pains, there is probably an excess of acetylcholine in tissues produced by pathological over-stimulation of nerves and possibly choline-estrase normally present is insufficient to neutralize it. Since cobra venom injections relieved nerve symptoms it is possible that it acted by neutralizing the excess of acetylcholine present. It is also possible that cobra venom may itself act like choline-estrase or may have a substance of this nature present in it. The work of this nature on the study of the biochemical changes in blood in leprosy before and after the injections of cobra venom is in progress, particularly to study its effects on choline-estrase.

It is not expected that cobra venom will ever replace chaulmoogra oil, and other measures in the treatment of nerve type of leprosy, but it may serve as an additional weapon in ameliorating some of the troublesome symptoms. This is important in view of the fact as stated by Rogers (*Lancet*, 1937) that about 60 to 70 per

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cent of cases of leprosy in India are of the nerve type. Cobra venom has been shown to give marked relief in a number of such nerve cases, particularly if the injections are given into the macular and anæsthetic patch. The sensations of numbness and formication are also improved.

A perusal of the table will show that in this small series, injection of cobra venom gave definite relief in about 60 to 80 per cent of out-door patients to whom the injections were given intramuscularly or intradermally in and around the area of the nerve supply. The relief of pain was observed after the second or third injection and the pain disappeared almost completely after the fifth or sixth injection. The criteria of improvement were the return of normal sensations and better sleep at night for those who complained of sleeplessness due to severe pain or uncomfortable sensations, such as tingling and formication. Muir (1936) believes that the restoration and maintenance of a high standard of health and nutrition will keep leper patients free from pains. Badger and Patrick (1938) have reported great benefit in nerve pain after a few injections of vitamin B_1 in doses of 300 international units, injected intramuscularly. The swelling and tenderness of the nerves disappeared. The present authors have used mixed injections of vitamin B_1 (Betabion, Merck) and cobra venom with marked success in a few cases of neuritis which did not improve with cobra venom alone, believing that most of these resistant cases were due to vitamin B_1 deficiency. Vitamin B and cobra venom if used together would most probably be very useful therapeutic agents in cases of neuritis of leprosy.

Some of the fallacies in the interpretation of the data are :—

(1) The relief of the symptoms were recorded as reported by the patients themselves. Most of the patients treated were villagers and uneducated persons and their statements could not always be relied upon. They usually express the relief in the terms of annas out of a rupee.

(2) In the phase of reaction there may be acute neuritis and swelling of all lesions, but these usually subside automatically within a month or two with or without any medicine.

Summary

(1) In India about 75 per cent of the cases of leprosy are of the nerve type with symptoms of neuritis, *e.g.*, pain, formication, and pins-and-needle sensation. Injections of cobra venom undoubtedly relieve these symptoms in a large number of these patients.

(2) A possibility of the curative action of venom in leprosy has been discussed because cobra venom possesses the power of destroying the newly-formed tissues. If the venom could reach the tuberculoid in certain concentrations there is a possibility that it might help to dissolve them.

Tissue culture experiments show that the growth of tissues is unaffected by the presence of *M. lepræ*. Venom destroys the newly-formed cells and may therefore act on these growths disregarding the presence of *M. lepræ*.

(3) Trials on a more extensive scale should be carried out to test the possibilities of cobra venom in nerve type of leprosy prevailing in India, by itself and in combination with vitamin-B complex.

TABLE

Cases suffering from nerve leprosy treated with cobra venom

Number	Type of leprosy	Symptoms and complications	Dose injected (mouse units)	Effect produced
1	C1 N1	Thickened nerves, aching pains and sensation of heat in arms.	1, 2 / 1, 3, 4, 5, 6 = 22	Relief of pain in arms after first dose, legs second dose; intense itching and 'ants' especially nose: now relieved.
2	N2	Pain and heat in arms and legs.	1, 2, 3, 4 = 10	Pain almost gone.
3	C1 N2	Pins and needles in arms and calves.	1, 2, 3 / 4, 5 = 15	Complete relief of symptoms for a month; now pins and needles, probably due to rains.
4	C1 N2	Nerve pains below elbows and knees.	1, 2, 3, 4, 5, 5, 8 = 28	Legs improving, arms less relief; relief maintained.
5	C3 N2	Nerve pains right ulnar nerve.	1, 2, 3, 4, 5 / 6, 7, 10 = 38	Relief maintained four months; recurrence of ants in hands. Relief after third injection.
6	C1 N2	Nerve pains right ulnar nerve and leg (biting).	1, 2, 3 = 6	Relief after ten days.
7	C2 N3	Severe aching (reaction phase).	1, 2, 3 = 6	Relief immediate, asked for more as pains returned; no further pain after four months.
8	C3 N2	Cramps in hands and legs.	1, 2, 3, 4, 5 / 6, 7, 8 = 36	Relief after first dose: no pains now.

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TABLE—*concld.*

Number	Type of leprosy	Symptoms and complications	Dose injected (mouse units)	Effect produced
9	N1	Pins and needles in arms and legs, nerve thick and tender, no anæsthesia.	1, 2, 3 / 4, 5 = 15	Marked relief; no complaints.
10	N2	Pins and needles in right leg and arms.	1, 2, 3, 4, 5 = 15	Much relief; only slight ants.
11	N2	Reaction aching	1, 2, 3, 4 = 10	Relief after first dose, slightly twitching.
12	C2 N3	Aching all over body	1, 2, 3, 4, 5 = 15	Relief after first dose; pain only in left leg, perforating ulcer.
13	C2 N2	Pins and needles and loss of sensation.	1, 2, 3 = 6	Sensations returned.
14	C1 N3	Pain, pins and needles	1, 2, 3, 4, 5 = 15	Improvement by each dose, stopped attending.
15	C2 N2	Pins and needles in arms 12 days.	1, 1 = 2	Relief; slight return in shins.
16	C3 N2	Burning pain in nose and forehead (thickened nerves).	1, 2, 3, 4, 5, 6, 7, 8 = 36	In divided doses in the painful areas.
17	N2	Nerve pain and bullæ; heat in hand and feet.	1, 2, 3, 4 = 10	Painless, heat sensation gone.
18	C1 N2	Pain below knees, 12 days.	1, 2 / 3, 6 = 12	Did not come after two doses; feeling much better.
19	C2 N2	Pins and needles; burning pains.	1, 2 / 3 = 6	Much better, but returning pains due to missing these injections; did not return.
20	C2 N3	Nerve pain especially in foot (deformed).	1, 2, 3 = 6	Sensation returned arms and legs; much better, ants only on legs, not distressing.
21	C1 N3	Nerve pain	1 / 1, 2, 3, 4 = 11	Sensation returned arms and legs; much better, ants only on legs, not distressing.
22	N2	Nerve pain, swelling hands and feet.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 10, 10, 10 = 85	Swelling disappeared, painless definite improvement.
23	N1	Nervous patient, gangrene toe.	1, 2 = 3	Attended when pains worse; did not continue.
24	C3 N2	Nodules bursting	1 = 0.05	Injection stopped to be tried again; not returned yet.
25	C1 N2	Burning legs	1, 2 = 3	Only relief for one day ants. Died two months later of intercurrent disease.
26	N2 C2	Aching from knees and elbows downwards.	1 = 1	Sensation returning.
27	C2 N3	Aching left calf	1, 2, 3 = 6	None since.
28	N1	Pain shooting down right arm.	1, 2 = 3	Relieved; no return till 15 days ago, now slight pain.
29	N2 C2	Reaction pain, formication.	1, 2 = 3	Relieved; no reaction.
30	C1 N2	Nerve pains, severe since one year.	1, 1, 2, 3 = 7	No attacks since February.
31	C2 N1	Reaction pains, arms and legs.	1, 2 / 3, 4, 5, 6 = 21	Fever; no relief.
32	N1	Heat in feet, pins and needles left forearm and left hand.	1, 2, 3 = 6	Severe reaction after each injection.

Cases 1 to 14 showed marked relief.
„ 15 to 30 „ partial relief.
„ 31 and 32 „ no relief.

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INVESTIGATION AND CONSERVATIVE TREATMENT OF THE NASAL FACTOR IN ASTHMA

By F. T. HARRINGTON, M.R.C.S., L.R.C.P. (late I.M.S.)

THE condition known as asthma is associated with a general metabolic imbalance and is never due to one factor only. I have dealt in detail with the treatment of this condition in a recent book, and this article is more in the nature of an elaboration of the chapter on nasal treatment.

It cannot be over-emphasized that the less that is done to the asthmatic nose the better. For this reason conservative treatment is to be preferred to surgical interference whenever possible. I will quote one example showing the danger of operating unless it is absolutely imperative.

A friend of mine was consulted by an asthmatic patient for the removal of nasal polypi. He cleared one nostril only, as he was well aware of the danger of doing too much. As the result of this operation the patient entirely lost all traces of asthma from which she had been a constant sufferer.

After an interval of nearly a year during which time she had had no sign of spasm, she returned to the surgeon to have the other side done.

Against his better judgment he agreed and the other nostril was treated. The immediate result was a return of the asthma in an intensified form and no subsequent treatment has been of any avail.

This is a common experience of all who have a great deal to do with the asthmatic state, though it is impossible yet to give any satisfactory reason for it.

Bearing this in mind I will proceed to outline examination and treatments which present none of the dangers or finality of a surgical operation, inasmuch as they are constructive instead of destructive.

Replacement

The work of Proetz of America is a real advance as a means of investigating and treating conditions within the sinus. He called it 'displacement' treatment. We prefer to call it 'replacement' treatment.

By this means we can investigate the true condition of the sinuses and also the patency of their ostia.

A patient whom I was asked to see had previously been *x*-rayed for possible sinus trouble and the report was negative. By Proetz's method of examination it was found that *none* of the sinuses on the left side of the head were normal. Subsequent operation revealed the presence of a mass of polypi in the left antrum and complete blockage of the ostia of all the other sinuses on that side. As a result of this operation combined with general treatment she has been completely restored to health after some twenty years of asthma and her weight has increased from under six stone to over nine.

Proetz's method of examination consists of the introduction of lipiodol into the upper nasal passages and the subsequent production of a vacuum which when released allows the lipiodol to enter such of the sinuses as are patent. Where a sinus admits lipiodol a complete picture of the sinus is obtained. Lipiodol is as essential to sinus *x*-ray as barium or bismuth is to intestinal *x*-ray.

I cannot do better than quote Proetz's own words with reference to our knowledge of the functions of the sinuses, he says :—'We have devised dozens of more or less ingenious ways of opening these cavities, all for one purpose—to let out infectious material, which sums up virtually the whole of sinus surgery, and cannot be considered a step ahead of the elementary surgical principle of draining an abscess anywhere in the body, as practised by the ancients. Now, unfortunately very little is known about some of the more elementary matters of the sinuses. To begin with we are not at all certain as to why they exist at all. We do not know why they are normally sterile and why presently they become infected. We do not know why once infected they may readily recover or why just as often they do not. The association between signs and symptoms is erratic. Some patients suffer intensely from sinus infections which judged by an old standard of observation appeared insignificant. Others on the contrary have noses which run copiously without putting their owners to any further inconvenience than the annoyance of blowing them'.

(*Continued from previous page*)

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The present writer's opinion as to why some sinuses which have been infected clear up while others do not is that the deciding factor is largely dietetic and that a diet which includes an adequate vitamin B_1 and B_2 content is an aid to spontaneous recovery.

We do know that a large percentage of sinus operations produce no improvement to the patient: in fact an operation will often aggravate the condition for which it is performed.

By far the best way of acquiring the technique of replacement is by working under the supervision of a skilled operator. To obtain such knowledge from print is difficult and unsatisfactory and the resulting *x*-rays examination likely to be inaccurate. The instruments required are :—

(1) A special metal syringe for the introduction of the lipiodol.
(2) A glass and rubber device rather in the nature of a breast pump, for the production of the vacuum.

These two instruments are specially made for this work.

Whether or not the nasal mucosa is to be shrunk has first to be decided.

The patient lies on his back upon a couch, with the head hanging well back over the end in such a way that the point of the chin is situated immediately above and in line with the external auditory meatus. This position is very important and must be maintained unmoved throughout the whole process. Rather less than half an ounce of lipiodol is slowly run into the nostrils from the metal syringe, dividing the amount between each nostril.

If the head is in the correct position the lipiodol will occupy the upper part of the nasal fossæ and cause no discomfort. The patient is instructed to breathe entirely through the open mouth until the completion of the operation.

The rubber bulb of the second syringe is now compressed and the glass nozzle inserted firmly into one nostril allowing no air to escape at the sides while the other nostril is closed by the operator's finger. If the bulb be released suddenly the patient is conscious of a violent shock and therefore it is necessary to produce suction rather gradually whilst the patient is instructed to swallow repeatedly until pressure is released. If swallowing under these conditions is not easy the patient may repeat the word 'kick' 'kick' 'kick' 'kick', which has the same effect.

As soon as both nostrils have been dealt with the patient is sat up and any surplus lipiodol allowed to drain away of its own accord into a dish, no effort being made to expel it. If all sinuses are patent, little if any of the lipiodol will return, assuming the technique has been correctly observed. The patient is now ready for *x*-ray, and, if the preparation has been correctly carried out, a clear insight into the actual condition of the sinuses will be obtained.

Normally, the lipiodol is removed from the sinuses by ciliary action in 72 hours and this should be observed by *x*-ray, as delay in this respect can result from pus or a general lack of vitality, either of which condition requires treatment.

The process of replacement also provides us with a valuable form of treatment when the condition within the sinuses is one of simple catarrh or a low-grade infection without too considerable pus formation and provided the ostia are patent.

The solution used for this purpose is composed of ephedrine and salt.

It is introduced into the sinuses in exactly the same way as lipiodol, but here only the second syringe is required.

The purpose of this treatment is to shrink and tone up the membranous lining of the sinuses and to promote drainage, and its effect is demonstrated by the subsequent outpouring of any pus and mucus that may be present.

By the process of replacement we have, therefore, an effective method of examining and treating conditions *within* the sinuses.

The Dowling pack

This method of treating ethmoidal infection was first brought to my notice by Burton Haseltine of Chicago some years ago during his visit to England, and I have satisfied myself in a very large number of cases that by its use we have an entirely satisfactory mode of treatment for this condition.

One of the commonest conditions, and one that is most frequently overlooked in asthma, is ethmoiditis. This is understandable, for it is not a condition which can be seen by casual observation.

Nasal examination in all cases of asthma requires good illumination and the skilled use of the naso-pharyngoscope. The significance of ethmoiditis in these cases depends on the nerve distribution and hence this area is sometimes called the asthmo-genetic zone.

As the result of irritation or pressure in the ethmoid area a stimulus passes on by means of the sensory tract from the trigeminal and enters the 'nucleus ambiguus' to continue *via* the motor routes of the glosso-pharyngeal and vagus nerves to form the naso-pulmonary reflex arc. In a highly toxic patient this may easily be demonstrated by lightly rubbing the ethmoid area with a pledget of cotton-wool on a probe, a wheeze will immediately be heard in the corresponding side of the chest.

Dowling was an ophthalmologist and he used his 'pack' treatment for certain eye conditions, such as conjunctivitis, and it still forms the most effective treatment in these cases.

Dowling used single pledgets of cotton-wool soaked in 10 per cent aqueous solution of argyrol. As the pathology lies beneath the surface, the object of treatment demands the use of a non-irritating bactericide, capable of penetrating the

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mucous membrane in order to reach the cells below. Dowling discovered that argyrol fulfilled these requirements, and it has been shown that the solution is distributed far beyond the area of its application.

Here is the technique as carried out in my practice for over ten years.

Instead of a single tampon, I use a number of thin and delicate pencils of long fibre cotton. These are successively applied by means of a slender, polished and tapering steel applicator in sufficient numbers to cover the nasal mucosa all the way from the naso-pharyngeal vault and the cribriform plate around the under surface of the ethmoidal turbinal and upward upon its outer surface to a considerable extent.

After swelling of the mucous membrane is reduced by a few treatments, the turbinal can be almost entirely enveloped by the tampons. It is desirable that the cotton be easily released from the applicator and left at the farthest point reached without crowding or friction. The economical nose specialist who uses rough, rusty, or crooked applicators often, unwittingly does an intranasal massage that leaves his patient in worse condition than before.

I understand that Dr. Hille of America has substituted a colloidal silver chloride, which he calls 'lunosol' and which he claims to be entirely bland and stainless. I am not able to express any opinion on 'lunosol' as I have not yet had an opportunity of using it.

Apart from the therapeutic value of the 'pack', it has a diagnostic use. When pus is present the plugs on removal are found to be blanched instead of dark brown.

Apart from a little watering of the eyes during the first or second treatments, the application should cause no discomfort of any kind and the plugs remain *in situ* for an hour, after which they can be removed by the patient or the operator.

Treatment is carried out daily for a fortnight, after which twice or thrice a week for a month is usually sufficient.

The nose should be cleansed with an alkaline lotion before the insertion of the plugs and gentleness is essential for carelessness will readily provoke spasm.

It is very interesting to observe the reduction of inflamed and swollen turbinates as the result of treatment and it is of further interest to note that the tendency to head colds is greatly reduced by their use.

Diastolization.—Another successful form of treatment which I have employed for some years is Gautier's diastolization. It consists of intranasal massage by means of dilatable rubber bougies shaped to fit the nasal fossæ. The bougies are made in five sizes and are manipulated by means of a rubber bulb and connecting tube which, on compression, force air into the bougie which becomes rigid.

This treatment is indicated in catarrhal conditions and as a means of restoring the air way when obstruction is due to œdematous conditions. Also I use it in preference to the cautery for desensitizing the nose.

Sensitive points on the nasal septum or turbinates which when irritated produce a coughing or sneezing reflex are usually cauterized, but in diastolization one has a far more efficient and lasting mode of treatment and it is constructive where the cautery is destructive. A spongy, œdematous nasal mucous membrane associated with nasal catarrh and deafness clears up rapidly and completely.

The effect of intra-nasal massage is to restore tone to the nerves, muscles and mucosa of the naso-pharynx and adnexa.

This treatment was first carried out by Dr. Gautier of Paris and it is in regular use at his clinic (Hôpital Dispensaire); it is also practised by Professor Worms at Hôpital Val-de-Gras.

Apart from the method now to be described, treatment is carried out at these clinics by means of the vibrating sinusoidal current, but as this treatment is not directly applicable to cases of asthma it will not be dealt with here.

Before commencing treatment, the nasal respiration is estimated by means of the 'masque de peche'. This apparatus consists of a tightly fitting face mask and manometer.

The patient is instructed to breathe vigorously in and out through the nose with lips tightly shut. The mean reading is taken, and, after adequacy of nasal respiration is estimated, treatment is commenced.

The nose is first washed out with a simple alkaline lotion and dried. One of the smaller sterilized bougies is connected to the rubber bulb and passed gently into the nasal fossa to its full extent, no notice being taken of turbinals.

With the bougie in this position, it is dilated by pressure on the bulb and retained thus for two or three minutes to compress the crypts and squeeze out mucus. The bulb is then released and the flaccid bougie withdrawn to about three-quarters of its length. The actual massage now takes place by passing the bougie in and out of the nose, alternately rigid and flaccid.

This process is repeated slowly some thirty or forty times, and is completed by again leaving the bougie distended in the nose for a minute or two. On completion of the treatment a quantity of mucus can be expelled by gently blowing the nose. Again this treatment is painless except for some mild discomfort during the first one or two treatments in the case of very sensitive noses. A little care for the first few treatments and even young children tolerate it without any trouble.

A course consists of some twenty applications which are carried out three times a week, the size of the bougie increasing from time to time. Improvement in the air way is of the greatest value in the treatment of asthma though only certain cases are suitable for diastolization and experience alone will allow the operator to

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decide this point. The 'masque de peche' will show the degree of improvement which results from treatment.

One should not leave the question of the nasal factor in asthma without brief reference to the use of nasal dilators as a means of improving the air way. In civilized man the nasal alæ are of little use as voluntary muscle for the purpose of dilating the nostril.

Few people appear to have the ability to dilate the nostril adequately at will with the result that through atrophy the nostrils tend to collapse, the passage of air becomes inadequate, and the mucous membrane within the nose loses tone and becomes swollen.

For the same reason it is essential during an examination of the nose to do so immediately the speculum is inserted, for after one or two breaths with the nostrils thus dilated the membrane shrinks and becomes paler.

We know what relief the asthmatic patient feels when he is told to breathe whilst both nostrils are held open.

The apertures of some nostrils appear as little more than slits which on inspiration tend to contract rather than dilate, closing the orifices still more. It is in such cases that mechanical dilatation is of great help and I have known several patients who have been able to sleep throughout the night, free of spasm simply by the use of nasal dilators.

These dilators are indicated in cases where, for some reason or another, the nasal apertures are narrow and incapable of adequate dilatation and cases where a deflected septum is causing partial blocking of one or both nostrils, and the patient refuses operation.

There are several types of dilator obtainable and I have investigated most of them, some made of celluloid and some of thick silver wire and another such as Hurst's pattern, which grips the bridge of the nose in the form of a 'pince-nez' from which by wire side pieces the nostrils are held open by spring action. The best model in my opinion is the 'Francis' dilator. It is made of silver wire, so constructed that, with the base resting low down on the septum, the intermediate arched portion holds open the nostril. It is only necessary to open the nostril at its extreme lower margin.

This dilator is made in four standard sizes although I have intermediate sizes made for me as a correct fit adds to comfort and efficiency.

Wire has the obvious advantage over celluloid of being more hygienic. After the first fitting by the doctor the patient is able to insert and remove the dilators without any difficulty. I recommend this simple procedure where there is nasal obstruction in the absence of pus and where operation is refused or postponed.

By the means that have been described it is possible to reduce nasal surgery in asthma to a minimum. In my own practice not more than 5 per cent of cases are subjected to operation while the results obtained by conservative measures are more certain and effective. I am never as sanguine regarding the prognosis in a case of asthma when operation is inevitable as I am when the condition lends itself to one or other of the measures I have described.

No case of asthma can be completely cured whilst there remains a pathological condition within the nose or sinuses. We have however at our disposal adequate means of dealing with any nasal condition which can have any bearing on the asthma syndrome.

A word of warning must be given regarding the use of ionization in the treatment of asthma. This treatment, which can be very effective in hay fever and certain simple catarrhal conditions, would appear to offer scope for its use in asthma. Actually the reverse is the case.

Ionization in the case of asthma when any form of nasal treatment is required is a certain way of provoking spasm and should never be employed.

In conclusion, I should like to draw attention to certain new preparations which are proving of value in the treatment or prevention of broncho-spasm and which appear to have none of the ill effects of some preparations at present in common use.

For immediate control of the actual spasm, a preparation known as 'antispasmodic inhalation' is used by means of a hand inhaler fitted with a complete face mask or by means of an electric inhaler giving a continuous vapour. This preparation contains papaverine and ephedrine and I have not known it fail to control spasm within a minute or two. It has the great advantage over ephedrine injections in that the dose can be readily controlled and discontinued as soon as the spasm passes. Any question of nervous manifestations, heart-hurry, etc., are thus avoided. Tri-xanthin co. tabs. (Bencard) contain tri-xanthin and a barbiturate and are particularly indicated in cases of spasm produced by exertion. The patient is instructed to take one tablet half an hour before taking exercise and the effect is dramatic, the patient being able to take quite long walks without distress. Excellent results are said to have been obtained in certain other conditions including migraine, dysmenorrhœa, etc., but I have no personal experience of this.

Another valuable preparation is the 'antispasmodic suppository'. It is indicated in nocturnal asthma and its use in these cases is most effective. Peaceful sleep produces a striking improvement in the patient's appearance and well-being. I believe these preparations are now available in India and I should be glad to know the opinion of other observers as to their experience with them.

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HOBBS' TREATMENT WITH GLYCERINE APPLIED TO MALE URETHRA IN GONORRHŒA

By R. L. RAYMOND,
CAPTAIN, I.M.S.
Civil Surgeon
K. K. DE, L.M.P.
and
U. SOE NYUN, L.M.P.
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THE antiseptic treatment of gonorrhœal urethritis is very unsatisfactory. Irrigations are frequently described as being useful for their mechanical washing effects only. They may prevent backward spread by killing the organisms before they are again implanted in healthy mucosa, but this can at best only apply to the gonococcus (*see* below). Neither local irrigation nor oral therapy producing antiseptics in the urine can affect organisms in the Littré gland. Intravenous therapy that aims to apply the antiseptic direct to the organisms in the glands through the blood stream is more rational, but in practice is unsatisfactory. Mercurochrome and acriflavine are not sufficiently specific to kill the organisms in the great dilution in which they must reach them, *via* the blood stream. The manufacturers of Uleron claim more specific drug effects.

Of those organisms which are discharged in the pus into the urethra only the gonococcus could possibly be killed by any antiseptic, except the hypochlorites. It is difficult to find reports of experiments on the bactericidal power of drugs carried out against the gonococcus, so one cannot venture to say whether potassium permanganate has any selective action on the gonococcus. It certainly has none on the staphylococcus. Hence the large number of secondary infections where potassium permanganate is the irrigation fluid. However, we know that :—

(1) Hypochlorite solution containing 0.005 per cent available chlorine (*i.e.*, approximately eusol, 1 to 60 dilution) will kill virulent staphylococci in under one minute, whereas

(2) Potassium permanganate 1 to 1,000 and hydrarg. oxycyanide 1 to 1,000 will not kill the same organisms in over five minutes.

The inference is that if antiseptic effects are aimed at in local irrigation hypochlorite solutions should be preferred to the time-honoured potassium permanganate and hydrarg. oxycyanide.

However, once we admit that the mechanical effects are the most important, it would seem that drinking vast quantities of plain water with the subsequent frequent micturition is better than two or three irrigations a day, and without the attendant risk of causing secondary infection.

Because this washing alone is not enough and because antiseptic therapy is so unsatisfactory we have tried the osmotic effects of glycerine to coax out the organisms from the deeper layers with the stream of bactericidal tissue fluids. Because it has proved effective in uterine sepsis, it is reasonable to suppose that it should prove effective in the similar condition of urethral sepsis, similar in that these organisms are hidden in glands and submucosa inaccessible to antiseptics by direct application. Below is appended a table to show the course of the infection in 14 consecutive cases without and 22 cases with glycerine treatment. One grain of acriflavine is added to each 5 ounces of glycerine to ensure that it is sterile. Irrigation with potassium permanganate 1 to 8,000 was done in both series, and in the glycerine-treated group the glycerine was injected directly after irrigation.

The glycerine was injected with a sterile urethral syringe with a rubber olive on the nozzle and was retained in the urethra for as long as the patient could conveniently tolerate it. The glycerine causes smarting pain in the urethra. The glycerine has been forced into the posterior urethra and bladder at times either by accident or by design—the latter in female patients—without more discomfort than was caused in the anterior urethra. The injections were given once a day, but twice a day would probably be better. The urine becomes more turbid for one or two hours after injection owing to the tissue fluids, cells and debris extracted by the glycerine. The amount injected was enough comfortably to distend the urethra.

Although in almost all cases that reach hospital the infection has already spread to the posterior urethra and although glycerine therapy is essentially that of the anterior urethra, still benefit was derived. This is comparable to the improvement in nasal pan-sinusitis when the antra only are drained. We believe that in an early case of anterior urethritis the rational treatment would be glycerine injections, forced water drinking, hot fomentations to the urethra, and protein shock to raise the bactericidal power of the blood. We would of course bear in mind proseptasine and uleron.

Our standard of cure is of course not strict, because the patient usually decides it for us by walking out of the hospital when he feels well enough and there is no discharge, or when he is bored with the proceedings.

The table, however, shows that in each group 64 per cent arrived at the stage of clear first and second urines which we may in these circumstances call a cure. Where the urine was almost clear we may call them relieved—36 per cent without glycerine and 27 per cent with glycerine. The remaining two cases, both under glycerine treatment, left hospital early with only slight improvement.

Patients who show clear urine for some time before leaving hospital were being retained for prostatic massage and passage of sounds.

The degrees of cloudiness of the urine is expressed in the table as 3, 2, 1, 0. Every cloudy

(*Continued at foot of page* 733)

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TABLE I

Showing results without glycerine

| Cases | | Number of days of illness | | |

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TABLE II

Showing results with glycerine

Cases		Number of days of illness																									
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
1	a	12	10	32	21	22	33	21	22	22	32	33	12	22	21	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	12	10	32	21	22	33	21	22	22	32	33	12	22	21	::	::	::	::	::	::	::	::	::	::	::	::	::
2	a	22	10	22	21	22	32	21	22	22	32	33	22	22	21	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	22	10	22	21	22	32	21	22	22	32	33	22	22	21	::	::	::	::	::	::	::	::	::	::	::	::	::
3	a	21	00	21	21	21	32	21	22	11	22	22	21	22	10	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	21	00	21	21	21	32	21	22	11	22	22	21	22	10	::	::	::	::	::	::	::	::	::	::	::	::	::
4	a	22	00	10	21	21	32	21	21	11	21	32	01	22	10	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	22	00	10	21	21	32	21	21	11	21	32	01	22	10	::	::	::	::	::	::	::	::	::	::	::	::	::
5	a	00	00	10	10	21	31	21	32	10	11	22	22	22	10	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	00	00	10	10	21	31	21	32	10	11	22	22	22	10	::	::	::	::	::	::	::	::	::	::	::	::	::
6	a	00	00	10	10	21	21	21	31	10	11	32	01	21	10	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	00	00	10	10	21	21	21	31	10	11	32	01	21	10	::	::	::	::	::	::	::	::	::	::	::	::	::
7	a	00	00	10	10	21	21	21	21	10	21	22	21	11	00	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	00	00	10	10	21	21	21	21	10	21	22	21	11	00	::	::	::	::	::	::	::	::	::	::	::	::	::
8	a	01	00	10	10	21	21	10	10	10	21	22	21	12	00	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	01	00	10	10	21	21	10	10	10	21	22	21	12	00	::	::	::	::	::	::	::	::	::	::	::	::	::
9	a	00	00	10	10	21	21	21	10	10	21	22	01	11	00	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	00	00	10	10	21	21	21	10	10	21	22	01	11	00	::	::	::	::	::	::	::	::	::	::	::	::	::
10	a	00	00	00	10	21	21	10	::	00	11	21	10	00	00	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	00	00	00	10	21	21	10	::	00	11	21	10	00	00	::	::	::	::	::	::	::	::	::	::	::	::	::
11	a	00	00	00	::	::	10	10	::	00	21	22	10	00	00	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	00	00	00	::	::	10	10	::	00	21	22	10	00	00	::	::	::	::	::	::	::	::	::	::	::	::	::
12	a	00	00	00	::	::	10	10	::	00	22	21	10	00	00	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	00	00	00	::	::	10	10	::	00	22	21	10	00	00	::	::	::	::	::	::	::	::	::	::	::	::	::
13	a	::	00	::	::	::	10	10	::	00	11	11	21	00	00	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	::	00	::	::	::	10	10	::	00	11	11	21	00	00	::	::	::	::	::	::	::	::	::	::	::	::	::
14	a	::	00	::	::	::	10	10	::	00	::	11	22	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	::	00	::	::	::	10	10	::	00	::	11	22	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::
15	a	::	00	::	::	::	10	10	::	::	::	10	11	11	::	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	::	00	::	::	::	10	10	::	::	::	10	11	11	::	::	::	::	::	::	::	::	::	::	::	::	::	::
16	a	::	::	::	::	::	10	10	::	::	::	00	11	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	::	::	::	::	::	10	10	::	::	::	00	11	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::
17	a	::	::	::	::	::	10	10	::	::	::	00	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	::	::	::	::	::	10	10	::	::	::	00	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::
18	a	::	::	::	::	::	10	00	::	::	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	::	::	::	::	::	10	00	::	::	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
19	a	::	::	::	::	::	10	00	::	::	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	::	::	::	::	::	10	00	::	::	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
20	a	::	::	::	::	::	10	21	::	::	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	::	::	::	::	::	10	21	::	::	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
21	a	::	::	::	::	::	10	00	::	::	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	::	::	::	::	::	10	00	::	::	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
22	a	::	::	::	::	::	10	00	::	::	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	::	::	::	::	::	10	00	::	::	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
23	a	::	::	::	::	::	00	00	::	::	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	::	::	::	::	::	00	00	::	::	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
24	a	::	::	::	::	::	00	00	::	::	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	::	::	::	::	::	00	00	::	::	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
25	a	::	::	::	::	::	00	00	::	::	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	::	::	::	::	::	00	00	::	::	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
26	a	::	::	::	::	::	00	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	::	::	::	::	::	00	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
27	a	::	::	::	::	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::
	b	::	::	::	::	::	00	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::	::

* Cloudy on 52nd, 55th and 56th (*a*) days.
† Cloudy on 51st (*a*), 57th (*b*) and 63rd to 66th (*a*) and remained clear to 80th day.

(*a*) First glass, (*b*) Second glass.

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TABLE II—*concld.*

Cases		Number of days of illness																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
15	*a*	0	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	: :	0	0	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	0*
	b	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	: :	0	0	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	0
16	*a*	2	1	2	1	0	0	1	0	0	0	0	0	0	0	0	0	: :	0	0	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	0
	b	1	1	2	1	0	0	1	0	0	0	0	0	0	0	0	0	: :	0	0	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	0
17	*a*	3	3	2	2	1	1	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :
	b	2	2	2	1	1	1	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :
18	*a*	2	2	2	2	2	2	2	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :
	b	2	2	2	2	1	1	2	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :
19	*a*	2	2	1	1	2	2	2	3	2	1	1	1	1	1	1	1	: :	2	2	0	1	1	1	0	1	1	1	0	0	: :
	b	1	1	0	0	1	1	1	2	1	0	0	0	0	0	0	0	: :	1	1	0	1	1	0	0	0	0	0	0	0	: :
20	*a*	1	1	1	1	2	2	1	2	1	1	1	1	1	1	0	0	: :	0	0	0	1	1	0	0	0	0	0	0	0	: :
	b	1	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	: :	0	0	0	0	0	0	0	0	0	0	0	0	: :
21	*a*	3	3	3	1	1	1	1	0	0	0	0	0	0	0	0	0	: :	0	0	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :
	b	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	: :	0	0	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :	: :
22	*a*	3	3	3	3	2	2	2	2	1	2	1	1	1	1	1	1	: :	1	1	0	1	1	0	0	0	0	0	0	0	: :
	b	3	3	2	2	1	1	1	1	1	1	0	0	0	0	0	0	: :	0	0	0	0	0	0	0	0	0	0	0	0	: :

* Both clear to 44th day.

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INDUCTION OF LABOUR

By G. P. CHARLEWOOD, M.B., Ch.B., M.C.O.G.
CAPTAIN, I.M.S.
Civil Surgeon, Morven, Mercara, Coorg

INDUCTION of labour during the period of viability of the fœtus has been extensively practised in the past, but its use is now becoming more and more restricted. One reason for this is that the fœtal mortality after induction of labour has been found to be unsatisfactory. For instance, Kleinwachter (1902) in Germany after an exhaustive study found that 78.3 per cent of babies are born alive after induction of labour, but only 60 per cent leave hospital alive and that a further percentage die in the first year because of the extra care and attention which premature babies require.

More recently, it has been pointed out that a premature child must lose the effects of the large amounts of gonadotropic and other hormones which are circulating the mother's blood at this time. A careful history in cases of hypoplasia of the uterus in adults will often bring to light the fact that the patient was a premature baby. So that, even in cases where the baby survives, one cannot be sure that irreparable harm has not been done.

Indications

(1) *Contracted pelvis.*—Induction of premature labour has been commonly employed in the past as the treatment for contracted pelvis. The results as far as the mother was concerned were always good, but the fœtal mortality varied from 12 to 45 per cent.

In view of the risks to the child resulting from premature induction of labour it is now the usual practice in most British and American hospitals to give a trial of labour in all cases of contracted pelvis (except where spontaneous delivery is obviously out of the question). Where the head does not enter the pelvis, lower-segment Cæsarean section is performed. This will be necessary in less than 20 per cent of cases.

Accurate measurement of the pelvic inlet by the modern *x*-ray method (as originally described by Boachacourt, 1900) is now widely used as a guide as to whether there is any likelihood of the head entering the pelvis, and, if so, the course labour is liable to take, *e.g.*, occipito-posterior in the android type of pelvis (Caldwell and Moloy, 1933).

The usual method of *x*-ray pelvimetry is briefly as follows :—The woman is placed sitting with the plane of the pelvic inlet horizontal, *i.e.*, sitting with her back making an angle of 58 degrees with the horizontal. An *x*-ray photograph is taken in this position and the patient is then removed but not the plate. A lead sheet (perforated with small holes drilled wherever parallel lines 1 cm. apart intersect similar lines drawn at right angles) is then placed in the position and plane which was previously occupied by the pelvic inlet and a second (flash) exposure is given to the same *x*-ray plate.

The distance between any two points on the photograph can be read off in centimetres by counting the dots, which result from the second exposure.

(2) *Albuminuria of pregnancy, pre-eclampsia, and chronic nephritis.*—These afford common indications for induction, where conservative treatment has failed. (It is worth noting that where conservative treatment has included the administration of progestin, labour will be extremely difficult to induce and, short of performing Cæsarean section, may prove impossible.)

Where the condition does not respond to conservative treatment, it is unwise to hold one's hand too long in the hope of getting a live baby, as the usual result in bad cases is a premature still-born child. Meanwhile, by postponing induction, the mother's kidneys have been exposed to unnecessary damage or eclampsia may have supervened. Cæsarean section is often the most practicable treatment.

(3) *Cardiac disease.*—In cardiac disease induction of labour is indicated where there is broken compensation which does not respond to appropriate treatment. In many of such cases, Cæsarean section with sterilization is the treatment of choice. One should always make an attempt to get decompensated heart cases into as good a condition as possible before imposing the additional strain of induction.

(*Continued from page* 729)

urine was tested with acetic acid for phosphates and periodically by microscopic examination.

The urine referred to in each case is the first morning specimen obtainable. Only one case developed a complication under treatment and that was a case of epididymitis in a glycerine-treated case.

The important feature of these two series is that the average number of days in hospital in group 1 (without glycerine) was 33, which conforms pretty well to the ordinary run of venereal department wards—while the average number of days in hospital in group 2 (with glycerine) was 18, excluding two cases that left hospital without improvement within a week and which bias the figures in favour of the glycerine-treated group. The percentage of cases cured and cases relieved is almost the same in each group, so we cannot be accused of 'cooking' the figures and moreover, as we have said, the patient is usually the arbiter in this matter.

The reason then for publishing these figures is that a line of treatment that has reduced the average stay in hospital of gonorrhœal patients by 45 per cent is worthy of record, and that, since the treatment is based on logical principles, it may be expected that these figures would be repeated.

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(4) *Placenta prævia.*—This often offers an absolute indication for induction, but is a special subject.

(5) *Postmaturity.*—The postmature child affords one of the most easily defensible indications for induction of labour. When the expected date of confinement has passed and disproportion begins to develop as estimated by the methods of Muller or Munro Kerr, labour should be induced, especially when there is a history of increasing distocia with each successive confinement. Efforts aimed at limiting the development of the fœtal head by decreasing the diet, or the calcium intake of the mother are of no avail. The children born of starving mothers, as clearly demonstrated in Germany in the war, are of normal size and development. Children born of osteomalacia mothers show normal calcification and those born of anæmic mothers have normal amounts of hæmoglobin. The fœtus leads a parasitic existence and takes its requirements irrespective of the mother's condition.

(6) *Diabetes.*—In diabetes induction is now rarely required where insulin therapy is thorough. The prognosis for the child remains doubtful.

(7) *Hydramnios.*—By embarrassing the respiration and heart action this may necessitate induction of labour. This is easily accomplished by rupture of the membranes. An attempt may be made to carry the woman to term by subumbilical paracentesis and the slow withdrawal of fluid. This procedure has proved successful at Queen Charlotte's Hospital. It is not permissible until a careful *x*-ray examination has failed to show any fœtal abnormality.

(8) *Chorea,* especially when its onset has not preceded the pregnancy, may be so severe as to require induction of labour or abortion as the case may be.

(9) *Tuberculosis* is no longer regarded as an indication for the termination of pregnancy. It has been shown by Bridgman and Norwood (1926) that more deaths follow the artificial termination of pregnancy than where it is allowed to run its natural course. Pregnancy should, of course, be scrupulously avoided. A possible indication for induction may arise in the occasional case where the child is viable, but the mother unlikely to live to term.

(10) *Peripheral neuritis.*—When this is severe and does not respond to vitamin B, etc., it is said to constitute an indication.

(11) *Pernicious anæmia.*—When this disease has existed prior to pregnancy it is an indication.

(12) *Convenience.*—The convenience of the patient or her doctor should never be allowed to influence the decision, still less to constitute the only indication for induction. Sooner or later disaster will follow such practice and in any case the doctor lays himself open to be blamed for any untoward development whether connected with the induction or not.

It should be remembered that even the simplest induction is not devoid of danger and as such should not be resorted to without sound indications.

Methods of induction

For patients at full term or when past term Watson's method or modifications thereof has been used with fair success for years. Several fœtal deaths have, however, been reported as the result of violent tetanic contractions of the uterus following the injection of pituitary extract. More recently, cases of unexplained fœtal death have occurred where the quinine has been suspected of causing the mischief. Many authorities have for this reason abandoned the use of quinine. Pituitary extract (1 c.cm.) or pitocin (10 units) may be given with safety on a pledget of cotton-wool placed beneath the inferior turbinate bone, as originally recommended by Hofbauer and Hoerner (1927). It is readily absorbed from the nasal mucous membrane and may be removed at once should the uterus contract unduly violently.

Watson's method is as follows :—At 6 p.m. castor oil 1 oz., at 7 p.m. quinine 10 gr., at 8 p.m. a large enema, at 9 p.m. quinine 10 gr., at 12 p.m. quinine 10 gr. Next morning at 9 a.m. if pains have not commenced 0.5 c.cm. pituitary extract half-hourly for six doses or until labour commences.

Œstrin (20,000 international benzoate units hourly for 10 injections) in conjunction with other methods may have the required effect, appears to be without danger, but is very expensive.

The vast majority of cases at or past term will respond satisfactorily to medical induction consisting of castor oil, enemas, intra-nasal pitocin and, where feasible, œstrin.

Earlier in pregnancy, however, the percentage of failures becomes increasingly large and more active interference may be required. Rupture of the membranes may be practised in combination with intra-nasal pitocin and will almost invariably prove successful. This method has been used for some years at the Johns Hopkins Hospital. There are, however, two definite contra-indications. Where there is a long cervix especially when associated with unabated constipation of pregnancy (showing that the patient is still under the influence of progestin) rupture of the membranes will frequently fail to bring on labour and will expose the woman to the risks of intra-partum infection. Secondly, rupture of the membranes is most indicated when the head is still floating and the child is alive, because the rush of fluid may carry the cord past the head and it may be obstructed during labour. Generally speaking rupture of the membranes will only be practicable at or fairly near term.

In cases where medical induction has failed, and where rupture of the membranes is not considered advisable, a stomach tube or better still a very thick-walled rectal tube (Goodrich

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REPORT OF A CASE OF EARLY ACQUIRED SYPHILIS IN A PATIENT WITH TERTIARY STIGMATA OF UNTREATED YAWS

By R. V. RAJAM, M.B., M.S., M.R.C.P.
Venereal Specialist, Government General Hospital, Madras

THE relationship between syphilis and yaws still remains an unsolved problem. To the tropical venereologist, the question is really more than of academical interest. In this part of India syphilis is fairly prevalent and yaws is endemic in many of the districts of the presidency, and the medical man is frequently confronted with cases, especially in children and adolescents, in which a clear-cut diagnosis is rendered difficult or impossible. But the social and psychological importance of differentiating the two diseases looms large in the eyes of the patient.

Some hold the view that yaws is only a tropical prototype of syphilis. The *Treponema pertenue* of yaws is morphologically indistinguishable from *T. pallida* of syphilis. Many of the clinical manifestations of the two infections are identical. Both the diseases become systemic infections very early and the serological reaction of the blood is the same. They resemble one another also in the rapid therapeutic response to organic arsenical drugs and bismuth compounds. Yaws is said to differ from syphilis in the method of transmission of infection from the infected to non-infected, in the absence of congenital or hereditary infection, in the rarity of visceral, cardio-aortic and nervous system involvement, and in its strict geographical distribution between the Tropics of Cancer and Capricorn. It is argued that these differences are conditioned by climate, sartorial and other social habits of the people, and by a racial peculiarity of interaction between the host and the parasite. As put forward by Stannus some years ago, an intensive comparative study, both clinical and pathological, of the two diseases under identical conditions of climate, race, etc., is still a desideratum.

Others are of opinion that the two diseases are distinct and mutually exclusive. In favour of this is quoted the fact that, in regions (Pacific islands, Fiji) where yaws is rife, syphilis is rare. This is explained by the theory of a reciprocal immunity. The question of reciprocal immunity was challenged by Neisser, von Prowazek and Castellani, who, using monkeys in experimental inoculation, declared that neither disease confers immunity to the other. But Levaditi found that monkeys immunized for yaws do not thereby acquire immunity to syphilis, but immunized for syphilis they have a partial immunity to yaws. To develop the immunity, the length of time which the infection has persisted in the animal is considered important. It is suggested by Nicholls that there is a true immunity to syphilis in those persons who have suffered a long course of untreated yaws.

Harrison thought that the relationship between the two diseases would not be decided by the results of experiments to determine resistance to infection with the organism of yaws after previous inoculation with the organism of syphilis, or *vice versa*. It has been proved by Brown, Pearce, Chesney, Kolle and others that rabbits which have been inoculated with one strain of *Treponema pallida*, though resistant to that particular strain, can be successfully reinoculated with a heterologous strain of the same organism. This experimental observation may as well be applied to the alleged absence of immunity between yaws and syphilis. The close similarity between yaws, syphilis, and the more recently described *Bejel* of Arabia, in their causative organisms, in their clinical manifestations, serology and therapeutic response, may be explained on the supposition that they are a group of disorders of the same family (treponematosis).

A male, aged 39 years, was admitted to the venereal department of the Government General Hospital with a penile sore and cutaneous eruptions.

Previous history.—In his 10th year the patient developed a sore at the nape of his neck which took nearly a month to heal. From that period for about 8 years he suffered from multiple recurrent ulcers scattered all over the body, but particularly on the extremities and, from his statement, it appears that he

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(*Continued from previous page*)

Company) may be passed between the uterine wall and the membranes. This should be combined with intra-nasal pitocin, etc. Efficient pains will usually start within 24 hours. If they do not the tube should be removed.

In many cases, Cæsarean section will be considered preferable as the results are more certain and there is no delay.

Summary

Induction of labour should be avoided as far as possible because of the fœtal mortality and because of the possibility of genital hypoplasia resulting from the early removal of the child from the influence of the maternal hormones.

The various indications for induction and the technique have been surveyed.

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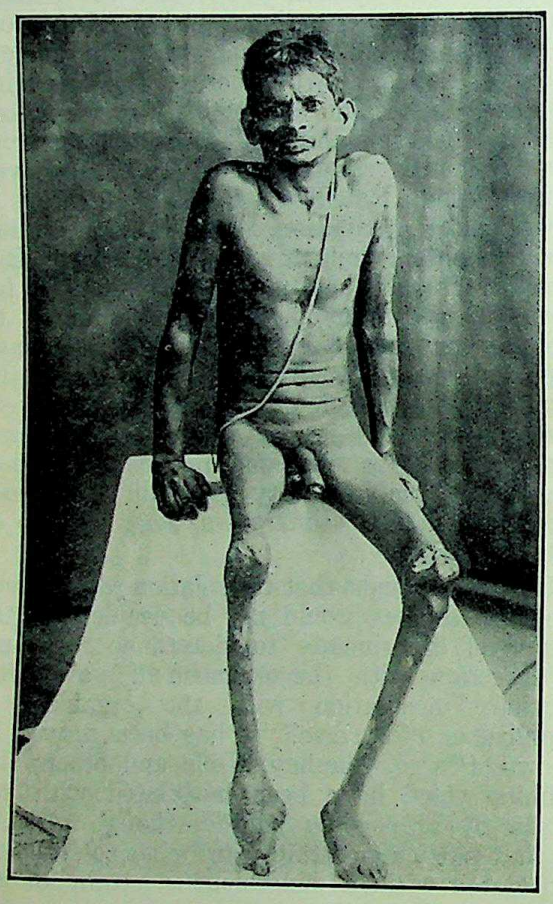
has had no special treatment for the condition. The ulcers healed and then spread. The patient finally became a cripple. Now for the past 19 years he has not suffered from any active disease.

Family history.—The patient is a native of Cochin where yaws is endemic. Unmarried. His father died when he was 16 years old. Mother alive and healthy. He has three brothers and three sisters all alive and healthy.

Present history.—Two and a half months ago he exposed himself to the risk of venereal infection and noticed a sore on his penis 15 days after exposure. About 8 weeks after the appearance of the penile lesion he developed a rash on the skin.

Condition on admission.—An ill-nourished man of 39 partly edentulous. Patient crawls about, being unable to stand and walk. Multiple, puckered, thickened scars of old ulcers on the arms, shoulder regions, buttocks, legs and feet. Both the lower extremities are badly deformed. The skin of the limbs, especially



the legs and knees, is one mass of adherent cicatricial tissue. The bones of the legs are considerably atrophied and thin. The right foot is a shapeless mass of pseudo-elephantiasis. Both the knee joints are ankylosed in the position of partial flexion. The right hand and fingers are also deformed and scarred. The accompanying photograph reveals more than any description the state of the lower limbs.

An indurated papulo-ulcerative chancre on the anterior aspect of the coronal sulcus is partly visible in the photograph. The glands in both inguinal regions are slightly enlarged, painless and discrete. Scattered papular syphilides on the trunk and limbs. No mucous membrane or muco-cutaneous lesions. No stigmata of congenital syphilis. Dark-ground examination of the serum from the chancre showed teeming *Treponema pallida*. The Kahn and Wassermann reactions of the blood were positive. The patient was put on anti-syphilitic treatment and the chancre and cutaneous rash rapidly disappeared.

(*Continued at foot of next column*)

THE TREATMENT OF ANIMALS WITH ANTIRABIC VACCINE

By R. O. A. SMITH, D.T.M., I.M.D.
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J. P. McGUIRE, L.M.S.S.A. (Lond.), I.M.D.
E. D. STEPHENS, D.T.M., I.M.D.
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B. N. LAHIRI
SUBEDAR, I.M.D.
(*From the Pasteur Institute of India, Kasauli*)

THE advisability of treating animals with antirabic vaccine either as a prophylactic measure or subsequent to exposure to infection is a matter on which directors and other workers

(*Continued from previous column*)

So far as I can gather, there are not many such cases published in the literature. Hanschell (1928) related two cases, one in a male West Indian, and the other in a West African negro, who were seen by him with primary syphilis and with serological and clinical evidence of old yaws. Two other cases were reported by H. D. Chambers in 1937. In the first case, a woman who had yaws ten years previously gave birth to a child with signs of congenital syphilis and had a strongly positive Wassermann reaction. The chances of the mother transmitting yaws were considered remote. It was indirectly inferred that the mother must have been infected with syphilis. In the second case the mother had yaws two years prior to the birth of the child. This child showed no evidence of congenital syphilis, except that the Wassermann reaction was strongly positive.

Summary

1. A case is reported of early acquired syphilis in a patient with tertiary stigmata of untreated yaws of 29 years' duration.

2. The patient comes from Cochin State where yaws is endemic.

3. The photograph shows the terrible crippling and deformity caused by untreated yaws. Such profound pathological changes in the soft tissues and bone are very unusual in syphilis.

4. The presence of long-standing yaws has not conferred any immunity against syphilis and the reaction to the syphilitic infection both local (chancre) and the cutaneous was moderately severe.

My thanks are due to the Director, Barnard Institute of Radiology, for the clinical photograph.

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in Pasteur Institutes are not unanimously agreed.

One of the main reasons advanced against the treatment of animals is the difficulty of arranging for their proper segregation during the period they are at risk. From general observation in India it would seem that except in the case of dogs, and then only in certain circumscribed areas such as cantonments and well organized towns, animals exposed to infection get neither segregation nor treatment, the owner just trusting to luck that they may escape the disease. The lack of statistics renders it impossible to estimate the mortality from rabies among cattle and other useful domestic animals in India. Certain information on the subject can be obtained from the records of this Institute as the history cards of patients treated also record whether any animals have been bitten by the dogs who bit the patient. An examination of the cards of about 800 patients treated during 1937 shows the following number of animals having also been bitten :—

Species	Number bitten	Remarks
Camels ..	2	
Buffaloes ..	50	Also 3 cards marked 'several'.
Horses ..	3	
Goats ..	10	Also 2 cards marked 'several'.
Oxen ..	47	„ 5 „ „ „
Donkeys ..	5	„ 1 card „ „

In addition there were 20 other cards where it was stated that 'several animals were bitten', but these were not specified. It is unlikely that any of the above animals received antirabic treatment and the actual mortality among them is a matter for conjecture. There were also a number of dogs said to have been bitten by the rabid ones; the disposal of dogs exposed to infection, however, will be considered separately for various reasons.

Despite such a state of affairs no death from hydrophobia has been reported among persons treated at this Institute and its centres during the past 30 years for infections caused by horses, cows, donkeys, or buffaloes (Smith, 1937). The saliva of these species of animals has been proved by different workers to contain the virus.

Provided treatment is given when necessary it would appear that rabid cattle do not constitute a grave danger to man, but their death from the disease represents a serious loss to their owners. It may therefore be assumed that no serious contra-indications exist to the treatment of this class of animal in India. The efficacy or otherwise of the treatment could be estimated by the results obtained up to date, which are given in tabular form below.

Of domestic animals which are susceptible to the disease and transmit it freely, dogs are the only ones that need be considered. The treatment of dogs may conveniently be divided into :—

(1) Prophylactic treatment.
(2) Treatment after exposure to infection.

(1) The prophylactic treatment of dogs has been recommended by the International Rabies Conference (Marie *et al.*, 1927) and there are no serious reasons why prophylactic treatment should not be carried out on a large scale in India, as is being done in certain other countries. The vaccine itself is harmless, being composed of a dead carbolized fixed virus. The suggestion that such treatment may result in conferring a partial immunity and, if the animal be subsequently infected, give rise to conditions like 'inapparent' or 'recurrent' rabies need not cause any doubts. No reports of such conditions have emanated from Japan or America where the prophylactic treatment of dogs has been practised extensively. Neither have they been noticed at this Institute which has carried out the prophylactic inoculation of dogs on a small scale for the past five years.

(2) The treatment of dogs that have been exposed to infection is a different matter and is dependent largely on the value of the animal and the nature and position of the wounds it has sustained. It may here be mentioned that this Institute does not recommend the treatment of any dog which has been severely injured on the head or neck. As dogs are so susceptible to rabies, the chances of such an animal escaping the infection are very meagre and the kinder fate for the dog and the safer one for the owner and his immediate neighbours is to destroy the animal in as humane a manner as possible. Provided however that satisfactory segregation can be arranged it has become the practice for this Institute to encourage owners of valuable dogs which have not been severely wounded on the head and neck to have them treated. The precautionary measures to be adopted when it has been decided to treat such animals are laid down in the pamphlet on *Rabies and Antirabic Treatment in India* (Shortt, 1933), and need not be recounted here.

The results of treatment with our vaccine are now being collected six months after the date of completion, as is done in the case of humans, and below in tabular form are given the figures up to date.

The mortality among dogs treated after exposure to infection for these two years is a little over 2 per cent, which, considering the special susceptibility of dogs to rabies, is a very satisfactory figure. Cows and buffaloes also seem to respond to the treatment very efficiently. The loss of 3 out of 17 horses, however, represents a mortality of over 17 per cent, which seems a high figure. Of the three deaths, one was an animal which sustained 5 wounds on the forehead and treatment was begun 7 days late. In the second which had 2 wounds, one on the face and the

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TABLE

Statement showing results of animal treatment

Animal	Number of courses issued	History cards received		Total	Died of rabies	Died of suspected rabies	Remarks
		Prophylactically treated	Bitten or in contact				
1936.							
Dog	1,333	515	130	645	2	..	No deaths from rabies were reported among the animals treated prophylactically.
Horse, mule ..	18	..	10	10	..	..	
Cow, bullock, buffalo	8	..	4	4	..	..	
Elephant ..	1	..	..	..	..	..	
Cat	2	..	1	1	..	..	
Monkey ..	1	..	..	..	..	..	
TOTAL ..	1,363	515	145	660	2	..	
1937.							
Dog	1,264	453	258	711	3	3	No deaths from rabies were reported among the animals treated prophylactically.
Horse, mule ..	28	8	17	25	3	..	
Cow, bullock, buffalo	36	..	27	27	..	..	
Cat	1	..	..	..	..	..	
Monkey ..	1	1	..	1	..	..	
Elephant ..	1	..	1	1	..	..	
TOTAL ..	1,331	462	303	765	6	3	

other on the leg, treatment was begun 3 days late. The third was one of four treated in a remount depôt. All four animals were bitten on the nose by the same rabid dog, and treatment was begun four days after they were injured. It is gratifying to note that the other three animals survived. A dog and a buffalo, presumably infected by the same rabid animal in an adjoining village, received no treatment and died of the disease.

It may be concluded from the results that the vaccine confers a considerable degree of protection against infection, and that prophylactic and post-infectional inoculation of animals will save many lightly bitten ones that might otherwise succumb to the disease.

Treatment

The vaccine recommended for the treatment of animals is prepared in exactly the same manner as that for humans, only it is stronger, and the dosage for the different species of animals has been graduated according to their weights. For the prophylactic inoculation of dogs a series of seven daily inoculations of 6 per cent carbolized vaccine, 5 c.cm. for dogs weighing under 30 lb., and 10 c.cm. for those above that weight is recommended. Experiments conducted in the Institute have shown that the vaccine affords very efficient protection against the Indian strains of street virus, for a period of eight months and probably longer.

The following experiment was carried out to determine the efficacy of the carbolized vaccine prepared here compared with one on the open market. This proprietary vaccine is said to contain $33\frac{1}{3}$ per cent rabies brain and cord tissue in which the virus has been killed by chloroform. It is also stated that, while the use of the single dose as a prophylactic for dogs before exposure has been found highly satisfactory, the double dose or series of injections will accomplish more. It is unfortunate that many dog owners assume therefore that a single inoculation is all that is necessary to protect their animals. That this idea is erroneous may be concluded from the results of the experiments cited below.

Fifteen dogs divided into three groups of 5 each were used in the first experiment. One group received 5 c.cm. of Kasauli antirabic vaccine for 7 days; the second group were given one injection of the proprietary vaccine mentioned above on the seventh day of inoculation of the dogs in the first batch, and the last group of 5 were kept as controls.

Twenty-five days after the treatment the dogs were given a dose of street virus into the muscles of the neck.

It is unfortunate that one dog from each batch died before the infecting dose was given, so that four animals of each group only were available for the test.

In a second experiment 15 monkeys were treated and infected under identical conditions.

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The results of both experiments are given below in tabular form :—

TABLE

Comparison of Kasauli antirabic vaccine for animals and a proprietary antirabic vaccine

	Dogs			Monkeys		
		Died			Died	
	Infected	Other causes	Rabies	Infected	Other causes	Rabies
Kasauli vaccine ..	4	1	0	3*	0	0
Proprietary vaccine ..	4	1	3	5	0	3
Controls	4	0	4	5	0	2

*Two died before infection from dysentery.

The results indicate that a single dose of vaccine of the type tested composed of dead fixed virus is not sufficient to protect an animal. Hermann (1928) concluded from a number of experiments that a single inoculation of a live fixed virus as large as can safely be given is not sufficient to protect an animal.

In a country like India where no muzzling or quarantine laws are in force and the number of uncared-for and ownerless dogs is legion, efficient prophylactic immunization against rabies will afford owners who value their animals a definite measure of protection, both for their dogs and themselves.

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A Mirror of Hospital Practice

EPIDERMOLYSIS BULLOSA : A CASE REPORT

By B. M. KOTHARY, M.B., B.S.

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THE rarity of this condition is my plea for reporting the case.

A boy, aged 8 years, was admitted for multiple bullæ all over the body. The whole integument was covered with whitish scars resulting from the healing of such bullæ. The duration of his complaint was about seven years, that is, since his childhood. His sister about 12 years old was also suffering from the same disease. But another, older sister never had the trouble, nor had any of their forebears for three generations ever complained of it.

The history is that the child was attacked with small-pox during his childhood and ever since then he has been suffering from this condition. He is worse in the winter, while in the summer he is slightly better. Sometimes the bullæ are as big as lemons. Slight friction, pressure or irritation tends to produce blisters rapidly, which either rupture and dry up quickly or become secondarily infected on scratching. The bullæ are painless and do not tend to run into each other.

The nails have atrophied so much that there is no suggestion of their past existence on any finger or toe. The sites where bullæ appear most frequently are those which are exposed to pressure or injuries, namely, back of knuckles and phalanges of hands, elbows, knees, ankles and waist-line. There are no abnormalities in any other part of the body except the skin. Laboratory examinations of his blood, stools and urine do not show any abnormality.

The prognosis is reported to be unfavourable. The disease persists all through life and one is incapacitated from work. On the approach of adolescence a few lucky cases have improved, however. It certainly seems to be unfavourable in my case. Treatment is said to be unsatisfactory, and I have certainly found it to be so.

Presuming the disease to be a vasomotor disturbance due to abnormalities in the epidermis, calcium orally and intravenously was tried, but it did not improve the condition. Ergot was administered for a few days, but he developed amblyopia and therefore it had to be discontinued. Protein shock therapy was also given a trial through milk injections and autohæmotherapy. Ultra-violet exposures were given for quite a good number of sittings. Endocrinotherapy with thyroid and parathyroid extracts was also given its chance. Carbolized filtrate from the vesicles was therapeutically used. After all, the tendency to vesicle formation still persists as badly as when the patient was admitted.

I shall be grateful for any advice or suggestions for the treatment of a case of this kind.

Finally I must thank Mr. E. W. Hayward, F.R.C.S. (Ed.), Principal Medical Officer, Jodhpur State, for permission to publish this case.

MULTIPLE PERFORATIONS OF SMALL INTESTINE WITH RECOVERY

By E. H. WALLACE

CAPTAIN, I.M.S.

Civil Surgeon, Malakand

and

AMIN-UL-HAQ, M.B., B.S.

Lady Minto Hospital

A MOHAMMEDAN boy of four years was accidentally shot in the abdomen from a distance of one foot by a playmate with a 'Diana' air-rifle of German manufacture and of 0.17 grooved bore.

Operation was commenced 3½ hours after the injury and the abdomen was entered *via* a 3½ inches left paramedian incision. The pellet entered the abdomen

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at a point one inch to the left of the umbilicus and went through the left rectus. The course of the pellet was followed through four separate coils of the small intestine and the perforations being very small were partially closed by retraction of the muscular layers. There was only slight evidence of contamination of the abdominal cavity by fæces. The perforations were closed one by one by purse-string sutures with no. 000 catgut. On reaching the fifth coil only one entering perforation could be found. The pellet was searched for but could not be located and it was presumed that it had lodged in the lumen. Two small apertures in the mesentery were not sutured. The abdomen was closed and a small glove drain was retained for 24 hours.

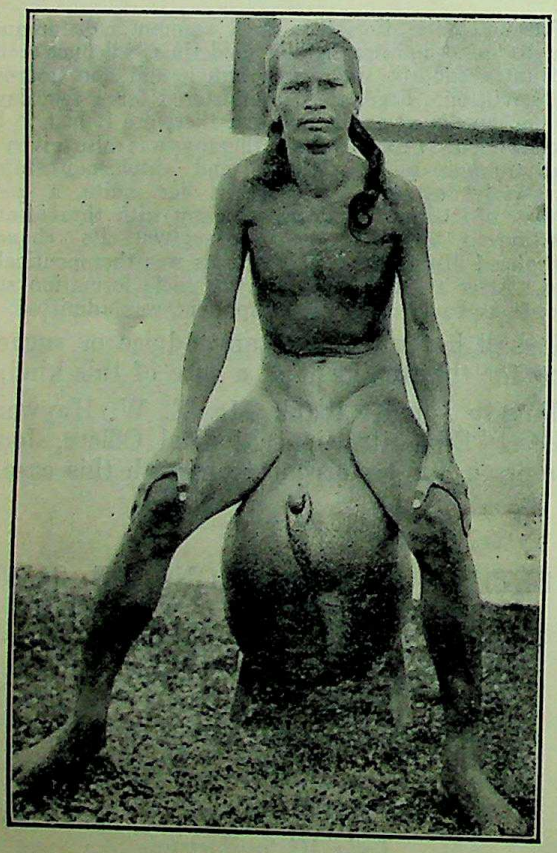
The pellet was recovered from a normal motion on the third day following operation. The patient made an uneventful recovery.

This case is described to show the surprising amount of damage that a small unlicensed air-rifle can cause and, secondly, it illustrates the value of early laparotomy in gun-shot wounds of the abdomen.

FILARIASIS IN THE MIKIR HILLS

By P. N. MITRA, M.B., D.T.M.
Mawkhar, Shillong

THOUGH I have been working in different parts of Assam for the last twenty-three years, I have only rarely seen clinical filariasis. The disease is occasionally seen among people coming



from Bengal, Bihar or Orissa; but the infection in such cases was contracted outside Assam. I have seen a few cases of elephantiasis of the legs among the indigenous population but I never succeeded in recovering microfilariæ from such persons and it was otherwise doubtful whether these cases were due to filariasis. However, in the Sibsagar District, in Golaghat, I came across well-marked clinical filariasis among the Mikirs. The Mikirs live in a low range of hills, running on the south of and more or less parallel to the Brahmaputra river, extending through the districts of Sibsagar and Nowgong in Assam. These hills are covered with dense jungle and are well watered with numerous springs and streams. There are no roads or bridges in these hills and no wheeled traffic is possible. The nearest hospital is at Golaghat about thirty miles away.

Elephantiasis of the legs and scrotum and enlarged lymph glands are the types that are met with. The photograph of one case shows the enormous size the scrotum had attained. Microfilariæ were searched for in this patient as well as in others. The patients were available only during the day and venous blood was withdrawn with a syringe and poured into 2 per cent acetic acid, in water. By this method sheathed microfilariæ were seen many times. One specimen was sent to the School of Tropical Medicine at Calcutta, and was reported upon as follows :—'The embryos are sheathed, have a smooth body, and show distinct and clear nuclei. They measure about $250\mu \times 8\mu$. They appear to be *Microfilaria bancrofti'*. In view of the fact that the filariasis in the North Cachar Hills was found to be due to *M. malayi*, I had expected the same species to be found here also. There were no opportunities for a search for the vector. It appears that the disease is limited to the Mikir Hills because clinical filariasis is not seen among the people outside this area.

The tumour was successfully removed.

FULMINANT CASE OF ULCERATIVE ENDOCARDITIS

By A. ACHUTHAN, L.M.P.
and
M. KELU, L.M.P.
Sub-Assistant Surgeons, Central Jail, Cannanore

CONVICT no. 4741 was committed to this jail on 14th January, 1938. He was overhauled and classified III-L. (Health of convicts is classified as I-H, first class, fit for hard labour, II-M, second class, fit for medium labour, and III-L, third class, fit for only light labour.)

His condition was as follows:—

Previous history.—He had had four attacks of fever attended with shivering and pain all over the body. These attacks lasted two or three days and occurred at intervals of about a month.

Condition on admission to the jail.—The apex beat of the heart was in the normal place. There was no dilatation or hypertrophy, but there was a double mitral murmur. Nothing organically wrong was discovered in other systems.

On 25th April, 1938, he was brought to the hospital suffering from fever with rigor. Temperature was 100.4°F. Blood was examined for malarial parasites and found negative. Differential blood count showed polymorphonuclears 68 per cent, lymphocytes 30 per

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cent and mononuclears 2 per cent. He was very restless. Auscultation of heart and lungs revealed no new development. Pulse was 100 per minute and thready. He was complaining of great pain in the abdomen around the navel. Focal examination revealed no sign of 'acute abdomen'. At 3 p.m. he started to pass loose watery stools with mucus in them, but no blood. Microscopic examination of stools revealed no dysenteric exudate.

All the reflexes were found to be normal. He became unconscious at about 6 p.m. Lumbar puncture was done and cerebro-spinal fluid was examined. It was clear and not under pressure. King Institute, Guindy, reported as under:—

Microscopically:—Very few cells. No cellular increase. No organisms found.

Culturally:—No growth obtained.

Microscopic examination of deposit from urine showed no red cells. The next morning he became completely unconscious. Breathing was stertorous. Temperature rose to 105°F. and he died at 6 p.m.

A tentative diagnosis of ulcerative endocarditis was made.

Post-mortem findings.—Mitral valve cusps were ulcerated and thickened having a cartilaginous feel. Nodular thickening was present on the aortic valves. Infarction was present in the spleen while lungs, stomach and kidneys showed embolic focal lesions. Unfortunately examination of brain was omitted.

Remarks

Interesting features of the case are :—

1. Very abrupt onset with shivering simulating malaria.
2. Fulminating character with death within 34 hours.
3. Apparent signs of abdominal crisis, cause of which was revealed on the *post-mortem* table, *viz*, embolic focal lesion of stomach.
4. Unconsciousness caused by embolism.
5. *Post-mortem* findings which left no doubt about the diagnosis.
6. There were no petechiæ on the finger tips nor tender spots in the legs.

We express our thanks to Major P. V. Karamchandani, I.M.S., Superintendent, Central Jail, Cannanore, and Lieut.-Col. S. C. Contractor, I.M.S., Inspector-General of Prisons, Madras, for permission to publish this case.

TRAUMATIC DISLOCATION OF HIP

By M. G. KINI, M.C., M.B., M.ch. (Ortho.), F.R.C.S.Ed.

Surgeon, King George Hospital, Vizagapatam (S. India)

TRAUMATIC dislocations of hip may occur as a result of a fall from a height on an abducted hip, a heavy weight falling on the back with the hip in an abducted position or as the result of automobile accidents. 'Dash board dislocation' is the term used by American writers for dislocations that occur as a result of automobile accidents either to the driver or the companion in the driver's seat.

History of case.—In June 1930, a hydro-electrical engineer, aged 40 years, was driving a car and to avoid an accident he swerved. In spite of jamming on his foot-brake he dashed against a wall with a terrific impact. He felt the impact along the whole length of the right leg and felt a sensation as if something gave way in the right hip joint causing him severe pain and inability to use his leg. He was lifted out of the car and carried to the nearest travellers' bungalow where first aid was given. At a district headquarters hospital without *x*-ray facilities he was treated for nine days as a case of sprain in the region of the hip. On the 10th day he was admitted in the General Hospital, Madras, under my care.

On admission, a swelling in the region of the right hip with adduction and flexion deformity of hip and flexion of the knee was found. Movements of the hip were very painful and could not be elicited. A real

Fig. 1.—Radiograph showing traumatic dislocation of the right hip, with fracture of the acetabular shelf.

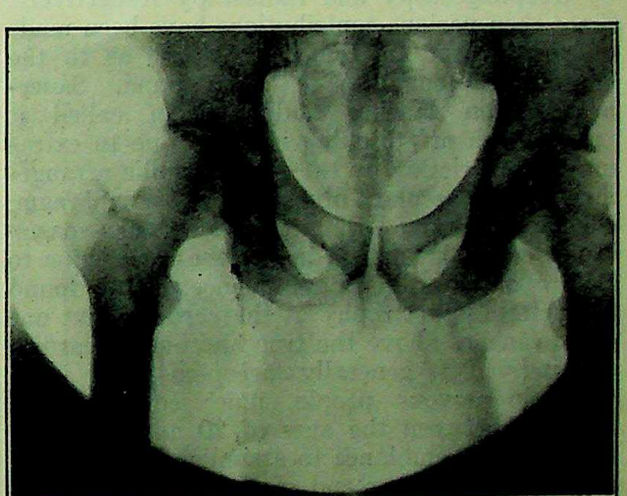

Fig. 2.—Shows the condition of the joint eight years after reduction.

shortening of 1½ inches was found. The tip of the great trochanter was found well above Nelaton's line. The head of the femur was found in an abnormal situation on the dorsum of the iliac bone. *X*-ray showed fracture of the top of the acetabular shelf with dorsal dislocation (figure 1).

Treatment.—Even though the dislocation was 11 days old, a closed reduction was attempted under general anæsthesia. For 1½ hours all methods of reduction were tried and proved futile. A last attempt was made using Jones's manœuvre by fixing the pelvis to the table, flexing the hip at a right angle and rotating it medially and resting the flexed knee on the shoulder of an assistant who was directed to push the knee upwards, maintaining an upward traction on the hip

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joint while a forward pressure over the trochanter was maintained. A sudden click was heard and the hip became free in its movements. The limb was fixed in abduction in plaster for eight weeks and weight bearing was allowed after three months. In six months' time he was able to play tennis, do hill climbing and do his normal work. On enquiry, after eight years, he sent an *x*-ray photograph of his right hip (figure 2), and wrote 'I may mention that I feel the joint perfectly all right and there is nothing even to draw your attention to it even in strenuous games'.

Points of interest

(1) The mechanism of the dislocation is due to a motor car accident where the hip was fixed to the seat and terrific recoil of the impact was conveyed through the foot-brake pedal to the whole leg causing a strain on the hip joint which gave way after fracturing the acetabular shelf.

(2) A closed reduction even 11 days after the accident was successful.

(3) The patient has a perfectly normal hip joint, as the *x*-ray picture 8 years after the accident shows.

CARDIO-SPASM OF THE ŒSOPHAGUS

By M. G. KINI, M.C., M.B., M.Ch. (Ortho.), F.R.C.S.Ed.
Surgeon, King George Hospital, Vizagapatam (S. India)

CARDIO-SPASM as a clinical entity has become a demonstrable feature since the advent of œsophagoscopy and radiography. Rosenheim in 1895 and Rumpell in 1897 studied this condition by œsophagoscopy and radioscopy respectively. Since then various contributions have been made on the subject and nothing definite as to the cause of the condition has been found. Sauerbruch, Von Hacker and Jackson called it 'phreno-spasm' thinking it to be due to extra-mural constriction by the sphincter-like arrangement of muscular fibres of the diaphragm. Fleiner maintained that it was a gastro-spasm. Hurst called it 'achalasia' of the cardia due to failure of co-ordinating influence. Abel found sphincteric hypertrophy at the cardia about one or two inches above the true anatomical cardiac opening. It is generally accepted that it is found in nervous people, more commonly in females, between the ages of 20 and 40 years. It bears a resemblance to a similar spasm which occurs at the upper end of œsophagus. On the analogy of mega-colon this condition is also called mega-gullet. Reports of this condition in South India are very few though globus hystericus is commonly found. Out of 4,416 admissions from the year 1932–37 only one case has come under the observation of the writer. The following case illustrates this condition :—

A female, aged 20 years, married, was admitted on 7th August, 1933, with a history of difficulty of swallowing, duration six years. She had lost a child aged 2 years, four years prior to admission. At first she noticed slight difficulty in swallowing with slight heaviness in the chest occasionally. Later, *i.e.*, two years before admission, she found that this difficulty of swallowing occurred at frequent intervals, particularly with solids. She used to drink large quantities of fluids with the solids. At first it helped her but later it caused her heaviness in the chest with severe distress, relieved by a copious vomit. The quantity of vomit was sometimes more than the quantity taken. As she had lost considerable weight and as the distress became very acute, she sought admission in King George Hospital.

On admission, she was found to be short statured and markedly emaciated. Respiratory and circulatory systems were normal. She was anæmic. The act of swallowing was noted by a stethoscope on the chest after giving a fluid drink. The usual sound was not heard. After a time she vomited large quantities of fluid containing food which she had taken overnight. A screen examination was done with a barium meal which showed a pear-shaped dilatation of the lower end of the œsophagus perching on the diaphragm, with constriction at the cardiac orifice (figures 1 and 2). The effect of atropine injection showed a slight relief of spasm (figure 3). Œsophagoscopy was not done.

Treatment.—Hurst's bougies were passed down the œsophagus observing them under the screen daily for three days until 44/64th inch size went in easily. She

Fig. 1. Fig. 3.

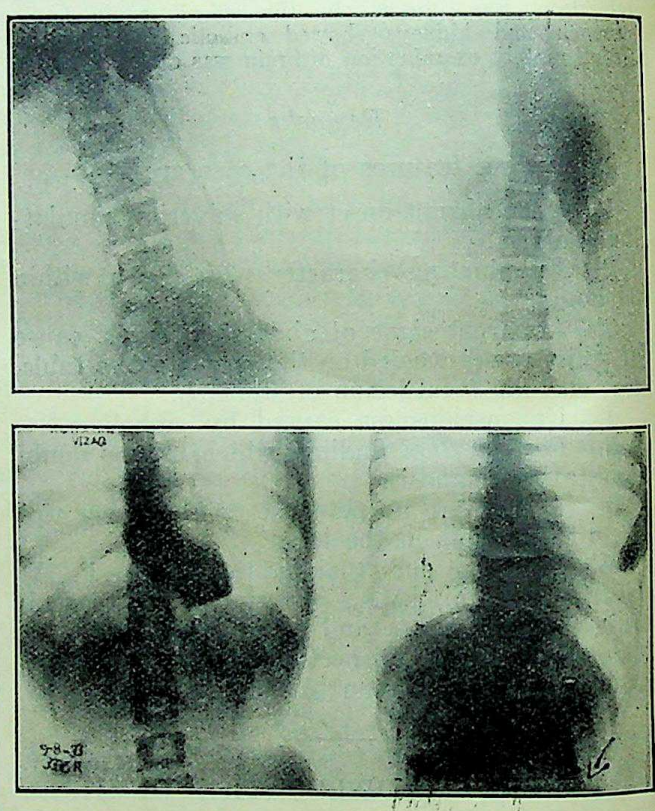

Fig. 2. Fig. 4.

Figs. 1 and 2.—A barium meal picture of the œsophagus showing a pear-shaped dilatation with a narrow opening, allowing a streak of barium to flow into the stomach.
Fig. 3.—Barium meal picture after atropine injection.
Fig. 4.—Shows the position of Hurst's bougie in the stomach.

was under observation for one month and discharged at the end of the period after making a screen examination with a barium meal. It showed a good functioning œsophagus and the dilatation though remarkably reduced in size was still appreciable. She felt better and began to put on weight.

The treatment of this condition is varied, but this case illustrated the point stressed by Hurst that this condition is due to incoördination and,

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once this spasm was relieved, the patient's condition improved considerably. On enquiry (1937) the patient wrote saying that she has gained in weight, and had another child two years after discharge from the hospital, which died at the age of 2 years. Her difficulty in swallowing has not recurred and she is keeping perfect health.

INCISIONAL HERNIA

By M. G. KINI, M.C., M.B., M.Ch. (Ortho.), F.R.C.S.Ed.
Surgeon, King George Hospital, Vizagapatam (S. India)

AN acute inflammatory abdominal condition which becomes localized and forms an abscess requiring drainage for more than 48 hours weakens the abdominal wall and results in 'incisional hernia'. The treatment of this condition is a difficult problem. In small herniæ it is easy to close the rent, and reinforce the abdominal wall by fascial suture. When the rent is big the question of reinforcement becomes difficult. The following case shows the result of use of a silver filigree for reinforcing the weakened abdominal wall in a big incisional hernia (figure 1).

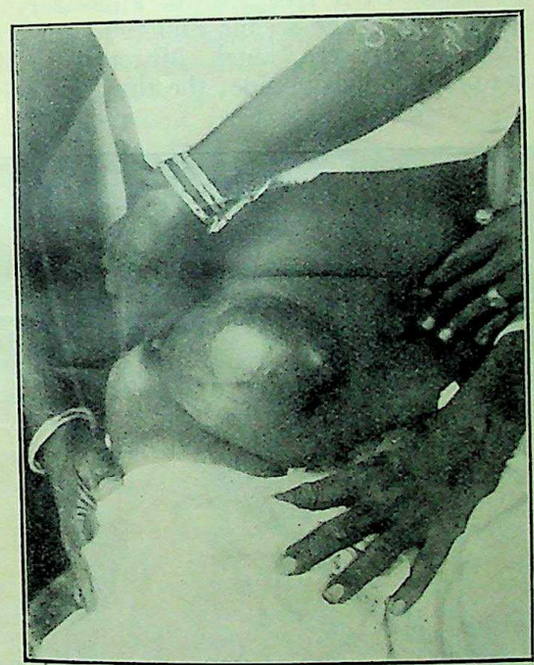

Fig. 1.—Aspect of the incisional hernia in the iliac region.

A female, aged 29 years, was admitted in July 1932 for an appendicular abscess which was drained through a McBurney's incision for more than a week. She was discharged cured after a month. On 27th August, 1934, she was admitted with a big hernia at the line of incision and was complaining of pain and constipation. A gap of two inches could be felt after reduction of hernia and on releasing the pressure the hernia recurred quickly. Peristaltic waves were seen under the skin due to the movement of the small bowel. On 30th September, 1934, she was operated upon. An elliptical portion of the redundant skin stretched over the hernia was removed, the peritoneum was mobilized all round the rent, the redundant portion was excised and the peritoneum was sutured as in a laparotomy wound. The transversalis and internal oblique muscles were brought together by two kangaroo-tendon stitches, and further strengthened by interrupted 30-day catgut stitches. A silver filigree 4 inches by 2 inches was carefully laid between the internal oblique and transversalis muscles behind and the external oblique in front. The

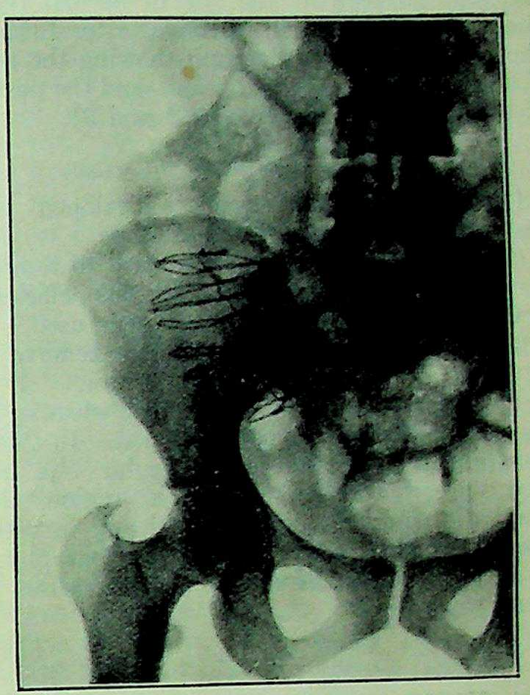

Fig. 2.—Radiograph showing the silver filigree in position three years after operation.

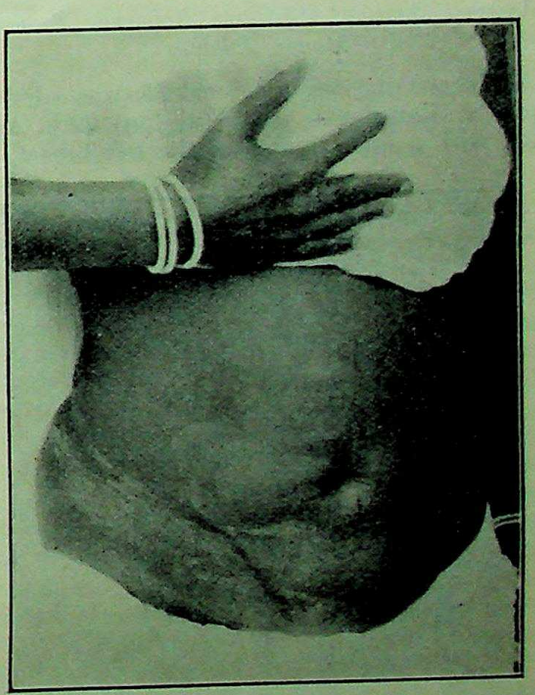

Fig. 3.—The condition of the abdominal wall three years after the repair.

aponeurosis of the external oblique was carefully stitched by the overlapping method. The abdominal wall felt perfectly firm at the end of operation. No attempt was made to investigate the appendicular condition. The wound healed by first intention and the patient was discharged cured in ten days' time.

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On 6th August, 1937, she was admitted for a perinephric abscess, and it was opened below the twelfth rib by an oblique incision. On examination of the abdominal wall it was found quite firm with no evidence of recurrence of hernia. She had no pain at the site of hernial repair. She was discharged in 10 days, after taking a photograph and a radiograph showing the result of operation for incisional hernia and the position of the silver filigree (figures 2 and 3).

Points of interest in this case

(1) An incisional hernia developed after drainage of an appendicular abscess.

(2) Silver filigree which was used to reinforce the weakened abdominal wall has efficiently served the purpose for which it was used.

(3) No attempt was made to remove the appendix at the time of hernial repair.

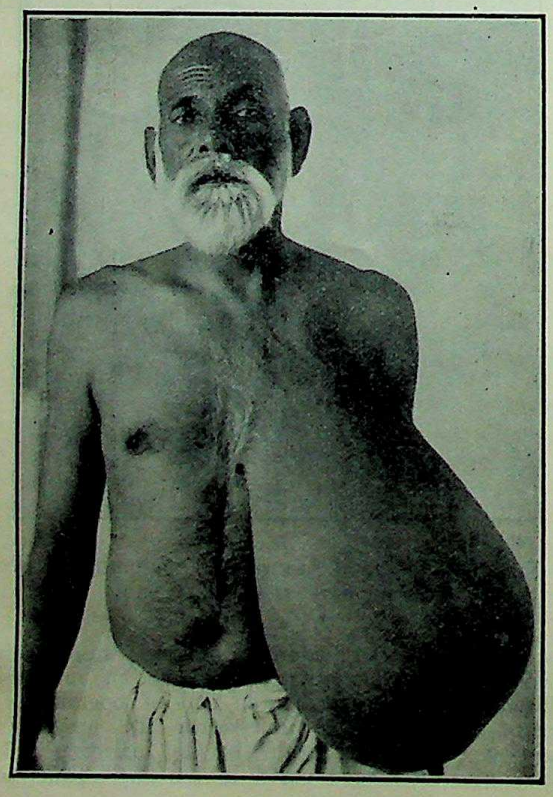
(4) She developed a perinephric abscess five years after the appendicular abscess. In this an infection from the old appendicular site may have spread to the perinephric region along lymphatic channels. She refused any investigation of her kidney condition by pyelography.

(5) Her constipation was cured after the hernia operation.

A HUGE LIPOMA OF THE BREAST

By RAI BAHADUR DR. CHHAGAN NATH
Assistant Surgeon, Officiating Residency Surgeon, Mewar, Udaipur

A MOHAMMEDAN male, aged 55, was admitted into the Lansdowne Hospital on 29th April, 1938, with a huge lipoma of the left breast.



Duration—14 years.

Length of the tumour above downwards	19	inches
Circumference round the pedicle ..	22	"
Circumference round lowest part ..	29	"
Weight of the tumour	27 lb. 12 oz.	

The interesting feature of the tumour was its large size, so that the patient used to carry it like a child in his arms.

He was operated upon on the 30th April and the whole tumour completely removed.

The patient made an uneventful recovery and was discharged on the 10th May.

A CASE OF CONGENITAL LOCAL GIGANTISM

By P. N. MITRA, M.B., D.T.M.
Mawkhar, Shillong

A HINDU female, aged 20, was admitted in the Golaghat Civil Hospital for kala-azar. It was noticed that the second and third fingers of the right hand were much bigger than their fellows of the opposite side; the third finger was

particularly disproportionate. The enlargement involved the bones, as well as the soft parts. The interphalangeal joints did not function, so she could not flex those fingers and fed herself with the left hand. The condition was congenital.

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Indian Medical Gazette

DECEMBER

DIET IN TYPHOID FEVER

'FEED a cold and starve a fever'. This is a popular fallacy that has been current since the days of Hippocrates, who gave his fever patients wine and thin barley gruel only; it is a fallacy that was shared by the medical profession until less than 100 years ago. In fact towards the end of the Dark Ages, when after that long period of quiescence physicians' minds again began to work, their first achievement in this connection was the invention of a false pathology to justify the Hippocratic teaching, and it was not until the middle of the last century that certain physicians, ignoring the half truths of the very incomplete pathological knowledge of their day and basing their teaching on clinical experience, reversed the teaching and 'fed their fevers'.

This practice has been fully justified by subsequent scientific observation; two fallacies have been exploded, namely, that free administration of food tends to raise the temperature of a febrile patient, and that the febrile patient does not absorb nourishment from the food he is given. It has been proved that ordinary light articles of diet are digested and absorbed as readily by the febrile as by the healthy patient, and that their absorption plays no part in raising the temperature.

It has been shown that the destructive effect of the toxins produced in fevers falls on the proteins; one school of thought argues from this that nitrogenous substances should therefore be given to replace this loss, another that the organism is already embarrassed by an excess of waste nitrogenous products and that proteins must therefore be withheld; probably neither is entirely right, but the present tendency is more in favour of the latter view and an attempt is made to replace the lost proteins as far as possible, not by the giving of an excess of proteins but by combining easily assimilable protein, *e.g.*, of milk, with other substances that spare proteins, namely carbohydrates and fats; fats often have a nauseating effect and the febrile patient is unable to take them except in small quantities, so that in actual practice the diet is often reduced to milk and carbohydrates.

Whilst the practice of 'feeding fevers' in general was adopted much earlier, it does not seem to have been applied to the treatment of typhoid fever until early in this century; again a misinterpretation of pathology was responsible. The pathologist exhibited the wasted intestine with the shallow typhoid ulcers and their tissue-paper-like bases, one of which had given way and brought the patient to the post-mortem room. It was a matter of surprise that the others had stood up against the passage of even fluid food and the normal intestinal movements. The deduction is that the less food that reaches this part of the intestine, the greater are the chances that the base of the ulcer will survive; so the next patient is given milk whey and glucose, and is lucky if he gets a thousand calories a day. It has been estimated that in typhoid, metabolism is increased by 40 per cent above the normal, so that the average male adult patient's daily requirements amount to about 4,000 calories and, as he is only getting 1,000, he has to make up the balance first by living on his own fat, which is soon exhausted, and then on his muscles, including his intestinal muscle, which would otherwise have formed a firm base for a typhoid ulcer, or good support for an intestinal arteriole that has been exposed by the separation of a slough.

This is not by any means all theory, and figures have been produced which show quite clearly that in practice the chance both of hæmorrhage and of perforation are reduced considerably when a high-calorie diet is given. The high-calorie diet is the routine in the treatment of typhoid in the United States and to a less extent in Great Britain, but in India the practice does not seem to extend beyond the large hospitals, and it is not always followed in these. This is in some ways surprising as physicians in this country are usually very ready to follow any new and successful development in other countries—and not infrequently to give a lead. The first and most important cause is the fact that in India professional nursing is almost non-existent outside the large hospitals, so that, if the patient is treated in his own home, as he is ninety-nine times out of a hundred, his relatives or friends undertake the nursing. Another cause is the physician's lack of authority in the Indian household, which is a most striking social phenomenon in this country. The father of a household will not hesitate to pay large fees to get the best medical opinion, he will listen most carefully to the doctor's opinion, and he will have all his prescriptions made up, but quite frequently these are never given to the patient. It is not surprising that parenteral treatment is so popular amongst medical practitioners in India; when he has given an injection the physician does know that his patient has had at least one dose of the drug. In the matter of diet he is powerless; if the mother of the household has decided that typhoid fever needs starvation, no amount of quotation of authorities nor expositions on pathology will convince her to the contrary. Further, the patient will be on her side as he has little inclination to take any food, and even in hospital practice it is often very difficult to persuade a patient to take the diet prescribed.

The figure 4,000 calories, that was mentioned above, was based on European and American standards, and of course it would be wrong to apply it to the Indian patient, but we may say

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that he should receive a diet of *at least* 20 calories per pound of his expected weight, calculated from a height-and-weight table, not of his actual weight, as, if he is already emaciated, his requirements are actually greater than if he is fat. This will put the requirements of the average Indian male adult at between 2,000 and 3,000 calories. As to how this diet is to be made up, one cannot dogmatize; not only will there be caste and religious customs but personal prejudices and idiosyncrasies to be considered. In most instances, milk will be the important item in the diet, but, on the basis of 2,500 calories, more than 6 pints would have to be taken, which is usually impossible. Many patients find it difficult to take ordinary milk and in these cases citrated or lactic acid milk may be better tolerated; variety can be introduced by substituting Horlick's, Ovaltine, or some other proprietary milk preparation. Lactose and dextrin are valuable for piling up the calories, as they are not so likely to give rise to fermentation as is glucose, and the former, not being so sweet, will be taken more readily by the patient. Whilst soups generally contain little nourishment, a well-made chicken broth will contain at least as many calories as the same quantity of milk, and, if caste considerations allow, makes a pleasant change. It is not essential that the diet should be entirely fluid when it enters the mouth; such things as biscuits, rusks and bread and butter are as fluid as milk by the time they pass through the pylorus. A little solid food of this kind will help to keep the patient's mouth in better condition. Eggs beaten up with milk can be included in the fluid diet, or given lightly cooked as a solid substance. Potatoes mashed with butter, vegetables and fruits strained through muslin to remove the coarser fibres that would form a residue, and even rice similarly treated will add variety, more calories, and vitamins. Whatever diet is given it should be carefully scrutinized to assess its vitamin content and the missing factors provided medicinally.

To persuade a patient to take his full quota of calories will often tax the good qualities of the nurse to the utmost extent, and to give him this amount of nourishment without producing diarrhœa, vomiting, tympanites, or other unfavourable symptoms will need not only skilful nursing but daily attention to the diet chart and wise prescribing on the part of the physician.

Typhoid fever in Indians is not as a general rule such a severe disease as it is in Europeans, but six weeks' starvation alone will reduce a patient's strength very considerably and necessitate a long convalescence. It should be the physician's aim to see that the patient leaves his bed at the end of his typhoid attack weighing as much as, if not more than, when he entered it. This may be difficult but it is far from impossible and it is an ideal that should be easier to achieve in this country where milder, less toxic attacks of typhoid are the rule, in hospital practice at any rate. In the Indian home we shall not alter the traditions of generations within a few months, years, or even decades, but on the other hand we should not acquiesce silently in a practice that we know to be against the best interests of our patient. Above all it is by the example of the results achieved in hospitals that in time we may hope to make the principle of 'feeding a fever' applicable to typhoid, even in the Indian home.

FIFTY YEARS OF SYNTHETIC PHARMACEUTICAL RESEARCH*

WE do not feel that we let this year close without a short reference to the jubilee of one of the world's most active centres of pharmaceutical research.

Early in 1888 the dye manufacturing firm of Friedrich Bayer and Company, as a result of some important discoveries made in their laboratories, decided to undertake the manufacture of pharmaceutical products; the first substance that they made on a commercial scale was phenacetin. This decision was undertaken at a time when the organic synthetic substances in the pharmacopœia could be counted on one's fingers. It was a momentous decision the importance of which even the most enthusiastic amongst those who made it can scarcely have foreseen. Since this date this firm has devoted itself unremittingly to pharmaceutical research; its chemists have started lines of investigation and have produced substances that have proved of inestimable value to medicine all over the world, but perhaps most of all to medicine in the tropics.

There are of course many other organizations, in Germany and in other countries, carrying out research work on pharmaceutical preparations, but few, if any, who have conducted their researches on such a large scale or who can show the same imposing list of successful preparations emanating from their laboratories.

'Aspirin', one of the early products of these laboratories, is now a household remedy, so much so that one is liable to forget that it is not many years ago since acetylsalicylic acid first appeared in the pharmacopœia. 'Salvarsan' has also almost become a generic name for the important group of arsenicals that followed its discovery and revolutionized the treatment of syphilis, and now the word 'prontosil' is suffering the same fate.

It would be no exaggeration to say that the preparations that originated in these laboratories have altered the whole outlook in tropical medicine. The antimonials alone have changed the 95-per-cent death rate of kala-azar into a 95-per-cent cure rate, and have provided an easy means of cure in numerous other serious and

* *Fifty Years of Bayer Remedies.* A book issued to commemorate the jubilee of this firm.

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chronic parasitic diseases. Bayer 205 in trypanosomiasis and surra, yatren in amœbiasis, and salvarsan in relapsing fever and yaws have proved invaluable drugs to the physician and veterinarian in tropical countries. The introduction of the synthetic anti-malarials might well be considered the apex of the achievements of the Elberfeld scientists, did we not know that intensive investigation on the present and on new lines was still being prosecuted in their laboratories, so that one not only hopes for, but may confidently expect, further successes.

The principals in this firm have consistently refused to issue any of their drugs to the general medical public until they have been thoroughly tried, both in the laboratory and in the field, and for the field trials they have unhesitatingly sought the help of scientific workers in tropical and other countries, without consideration of creed or nationality.

In return we believe that in many quarters they have received the same unprejudiced co-operation from the medical profession in our common struggle against disease.

Special Article

THE INCURABLES

By R. N. CHOPRA, M.D., SC.D. (Cantab.), F.R.C.P. (Lond.), C.I.E., K.H.P.
BREVET-COLONEL, I.M.S.
Director, School of Tropical Medicine, Calcutta

FROM the earliest days of history, life has imposed its stress and strain upon mankind. The continual strife with the elements, the dreadful toils and dangers a man has to undergo bring about ill health and disease which may end his uncertain existence. Man is terribly afraid of death, and makes every effort to prolong life as much as possible. In order to accomplish this, the body should be kept in good working order, and if ill health supervenes it should be combated. Unceasing struggle has therefore been carried on against disease from the earliest days of man's existence. Gods and goddesses were created to protect him from evil, and deities in anger or demons were propitiated by charms and amulets. After centuries of struggle, the spirit of science dawned and with it the will to go into the exact nature of the causation of disease by experiment and research. Thus, a more rational way of fighting disease was evolved. In this struggle, workers in different ages found that they could combat certain diseases with success, while against others they were powerless; these were termed *incurable diseases*. As science progressed many so-called *incurable diseases* were conquered; what was regarded as incurable in one age, became amenable to treatment in another. Great scourges such as plague, cholera, smallpox, leprosy, etc., are all in the process of being conquered. Development of preventive methods and advances in treatment have succeeded in freeing people in the western countries from many of these pests. Because of our imperfect methods of dealing with them in India, unfortunately, they still take a heavy toll of life and leave a trail of woe behind.

Ordinarily speaking the term 'incurable' is applied to those unfortunate victims of disease, in whom treatment with all its advances is ineffective and the rate of advent of death cannot be influenced. Such diseases or conditions may be *acute* or *chronic*. An instance of the former is hydrophobia, an acute infective disease, produced by a virus which is communicated to man by the bite of rabid dog, jackal, or wolf. When once the disease is established, there is no hope of recovery, but modern research has made its onset preventable by prophylactic treatment. Other diseases in this category are galloping phthisis, the acute leukæmias, a number of infectious diseases such as advanced tetanus, pneumonic plague, fulminating meningitis, and acute poliomyelitis. In the case of this group, in spite of all efforts on the part of science, the advent of death cannot be prevented, and the sufferer is relieved from his misery in a short time.

In the chronic type of incurable diseases, however, the unfortunate victim may go on suffering and lingering for prolonged periods. There are two main groups in this class: the first in which the disability produced is not marked in the early stages, and the individual afflicted may be able to carry on for many years, without being a burden to society. Such conditions are diabetes, kidney and heart disease, epilepsy, early malignant disease, etc. Considerable advance has been made in the treatment of these diseases during recent years, and they are rapidly becoming preventable or curable by development of techniques of early diagnosis. To the second group belong those who are permanently incapacitated from earning their livelihood and need active care by the community. Advanced phthisis, tuberculous disease of bones and joints, blood diseases such as leukæmia, nervous diseases, epilepsy, leprosy and others may be included in this group. Science is making valiant efforts to bring them under control and success has been attained in several directions. But cancer is a disease which has baffled medical science, and the problem of causation of this dread disease is still unsolved, in spite of an enormous amount of scientific research. Not only do we not know what cancer is, we do not even know to what category it belongs, whether microbic, metabolic, or degenerative. It is the stalking spectre among diseases and it is surrounded with all the horror which attaches to the incomprehensible. Medical research has made a large majority of cases of accessible cancer in the early stages amenable to roentgen rays, surgical, and radium treatment, in such a way as to render recurrence unlikely. But unfortunately many cases are not seen early enough, others are not accessible, and in these cases the end is inevitable. No one who studies the rapid progress of medical science doubts that eventually even this disease will become preventable or curable.

Cancer accounts for a large number of this group in the west, but fortunately its incidence is lower in this country. Those afflicted with it suffer intolerable pain often for prolonged periods, before death relieves them of their misery. The incurables belonging to the class of imbeciles, idiots, and those suffering from mental disorders have presented difficulties so far as prevention and cure is concerned, in fact the last-named class has showed a definite increase, on account of nervous strain imposed by life in large towns. These are adequately dealt with in most countries in asylums or mental hospitals, and science is evolving new methods of treatment for them. A visit to some of the institutions in this country will show what a large number of unfortunate people come into this category, who have no hope of ever being restored to health and who are a burden to themselves and to society.

Then there are the maimed and paralysed individuals who are the victims of congenital defects, nerve diseases, advanced leprosy, lathyrism, street accidents, venereal and rheumatic infections, filariasis, etc. A very large group in this country are those afflicted with blindness, which is so often preventable. These people

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have generally suffered from diseases that have passed away but have left a terrible legacy behind. In many cases in this group the much-needed care by the community is often not forthcoming and the sufferers are left to the mercy of the elements. These unfortunate individuals account for a large proportion of the beggar class in large towns in India.

This brief review of the incurable diseases will give one some idea of the importance of this problem and what medical science is doing towards its solution. While, in many of the western countries, adequate arrangements are provided to ameliorate the lot of these sufferers, in India little attention has been paid to the problem. According to the last census report (1931), there are 120,304 insane, 230,895 deaf-mutes, 601,370 blind and 147,911 lepers in India. A very large number of the population of this country suffer from various debilitating diseases which not only considerably reduce the working capacity of the people, but many of them are totally incapacitated. The *Annual Report of the Hospitals and Dispensaries under the Government of Bengal* (1935) shows that there are 100,626 persons suffering from venereal diseases or their sequelæ, 36,281 from tuberculosis of various forms, 6,508 cases from chronic leprosy, 24,810 from malignant tumours, 4,821 from filariasis causing definite disablement, and 4,129 from mental diseases, all of the incurable type. If this is the condition of one province in India, the condition of the rest of the country may be imagined. Only a small fraction of this large group are looked after. A cursory examination of the beggar class of any of the big cities will convince one of this.

It is to be greatly regretted that no organized effort has been made to deal with the important problem of incurables in this country. The public interest should be roused, and something should be done to bring into action the discoveries of medical science towards the prevention of incurability and proper care of the incurables. Illiteracy and ignorance among the masses are responsible for the production of a large section of the incurable class. Intensive educative propaganda is needed. One has only to see what has been accomplished in some of the western countries and to know how much can be done not only to diminish the number of incurables, but also to make the life of those who suffer from incurable affections less miserable and more contented. The platform, the stage, films, radio and newspapers combined have changed the whole aspect of the problem. The same can be done in India.

The causes leading to the creation of an incurable class should be thoroughly investigated and adequately dealt with. It has been roughly estimated that 30 per cent of the maimed beggars on the streets of large towns, such as Calcutta, are drawn from advanced types of leprosy. Adequate treatment in the early stages would almost entirely eliminate this factor. Then there are a fair number of mental deficients and morons who can be easily rehabilitated if proper care and attention is bestowed on them. Homes like the 'Bodhana Samiti' have already made good progress in this connection. Lathyrism and elephantiasis could be stamped out if suitable preventive measures, indicated by medical research, are taken. About 10 per cent of the beggars are blind. Blindness may be present from birth, but more often it is produced by smallpox, corneal ulceration, venereal diseases and nutritional defects, which are all preventable in the light of modern discoveries. It has been estimated that venereal diseases which are now preventable and curable are responsible for 40 per cent of blindness in children and 60 per cent in adults. The institution of eye clinics and travelling eye dispensaries will do much to reduce this group.

As regards the measures which can be taken to make the lot of incurables happy, much has been accomplished in the west, but even the fringe of the problem has not been touched in India. To start with, no accurate information is available with regard to the number of persons suffering from chronic incurable diseases. With the exception of a few homes for Europeans and Anglo-Indians, there are few disjointed organizations which interest themselves in this question. The Ramkrishna Mission Hospital in Benares is one of the few institutions in India where incurables are cared for, but the problem needs much wider attention. Apart from mental asylums there is a genuine need for public institutions for incurables who are unable to look after themselves.

Broadly speaking there are three types of incurable persons:—

(1) Those who require active medical aid in a hospital or infirmary.

(2) Those who need skilled nursing.

(3) Those for whom custodial care by competent attendants is necessary.

Well-organized homes and colonies should be started to deal with each of these three groups. Apart from lunatic asylums, a few such institutions exist for lepers, but these are inadequate, and there are none for other groups.

The Calcutta Corporation has recently appointed a committee to go into the beggar problem which has a bearing on this problem of incurables. It has been estimated that there are more than 12,000 beggars in Calcutta alone. Many of them suffer from incurable disease. A proposal has been put forward to start a more commodious refuge where such people can be looked after. In Bombay a similar scheme is on foot and all other towns should follow this lead. Such places could contribute substantially to their own upkeep, if the inmates were taught a number of lucrative trades. A few institutions for the blind are already in existence and are doing excellent work. It may be emphasized that the Government and municipalities can help by giving grants to such organizations, but they cannot be expected to shoulder the entire burden. The public should realize their responsibilities and come forward with donations, as is done in western countries, to help in the solution of incurable problem by promoting medical research and palliative measures.

The responsibility of the State and society is at least as great towards this class as towards the acute sufferer from disease.

Medical News

SUMMARY OF TUBERCULOSIS NEWS FOR THE MONTH OF OCTOBER 1938

1. HIS EXCELLENCY THE GOVERNOR OF PUNJAB laid the foundation stone of a tuberculosis sanatorium at Amritsar on the 19th October. This institution is the result of a handsome gift (Rs. 60,000) from a local philanthropist, towards building and equipment. The Amritsar Municipality has agreed to give an annual grant of Rs. 10,000 towards its maintenance. It is hoped that this institution will be the centre of a large institution not only for Amritsar, but for the whole of Punjab. It is understood that the donor has already promised to build another sanatorium near Dalhousie.

2. Madras Presidency observed a very successful Anti-tuberculosis Week (25th September to 2nd October) in aid of the King-Emperor's Anti-tuberculosis Fund. It was a week of extensive propaganda and education by means of talks, lectures, broadcast talks and distribution of literature, followed by brisk collection through a well-organized 'Flag Day' and 'odd anna and pie' collections through the local banks.

INDIAN MEDICAL COUNCIL

IN exercise of the power conferred by clause (*a*) of sub-section (1) of section 3 of the Indian Medical Council Act, 1933 (XXVII of 1933), the Central Government is pleased to nominate Lieutenant-Colonel M. J. Holgate, O.B.E., M.B., B.S. (Lond.), M.R.C.S.

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(Eng.), L.R.C.P. (Lond.), D.T.M. & H. (Lond.), I.M.S., Officiating Surgeon-General with the Government of Bombay, to be a member of the Medical Council of India, from Bombay, with effect from the 6th October, 1938, *vice* Major-General H. C. Buckley, I.M.S., resigned.

THE 29TH ANNUAL CONFERENCE, ALL-INDIA MEDICAL LICENTIATES' ASSOCIATION

THIS conference will be held at Gauhati from 24th to 26th December, 1938. The scientific section of the conference will be held on the 26th December.

The secretary points out that as this is the first of its kind to be held in Assam, and, as Gauhati is a place of religious, cultural, political, and industrial importance, large numbers of medical men and visitors are expected to attend.

Further, the conference will give ample opportunity for scientific discussion of matters of professional interest to the medical men attending.

The secretary hopes that members of the profession will contribute scientific papers to the conference and will attend.

G. S. DAS,
General Secretary, Reception Committee.
K. C. BOROOAH,
Secretary, Scientific Section, Gauhati.

[*Note.*—This notice was received after this number had been made up and we were only able to include it by excluding other matter. Even now it will not be read by many of our readers until the middle of December. May we once more protest against this practice of giving absurdly short notice of conferences of this nature?—EDITOR, *I. M. G.*]

Current Topics

The Use of Antistreptococcal Preparations in General Practice

By A. H. DOUTHWAITE, M.D., F.R.C.P.
(Abstracted from the *Practitioner*, Vol. CXXXIX, December 1937, p. 661)

THE advent of prontosil and its derivatives is of the utmost significance not only because it has profoundly altered, in a favourable sense, the prognosis of hæmolytic streptococcal infections, but also because it has established beyond all doubt that effective chemotherapy of microbial diseases is attainable. Hitherto drugs having a specific effect in destroying infecting organisms were confined to those diseases produced by non-bacterial agencies, *e.g.*, quinine and atebrin in malaria; arsphenamine in syphilis. The term sulphanilamide will be used throughout this paper to include the original prontosil and the several derivatives which are now used in its place. Only when necessary will distinction be made between the parent substance and its simpler off-shoots. This does not imply, however, that they are all of equal efficacy. That is a matter which is still the subject of study, but is not a point which affects the main purpose of this communication. The use of antistreptococcal sera will not be discussed beyond remarking that with the exception of the scarlatinal antitoxin no proof has been forthcoming of their efficacy. On the other hand, it should be remembered that the scarlatinal antitoxic serum has been life-saving in some acute streptococcal infections other than those of scarlet fever. The occasional sudden defervescence and recovery following its use in streptococcal bacteriæmia and even in meningitis cannot be ascribed to chance although the uncertainty of its effects (presumably due to a high degree of specificity) has led certain writers to that conclusion. Now, however, that a drug is available which appears to be habitually lethal to hæmolytic streptococci, the use of expensive and unreliable sera with their attendant risks will no longer be considered.

DISEASES DUE TO STREPTOCOCCI

Tonsillitis and Ludwig's angina.—Acute follicular tonsillitis responds readily to sulphanilamide provided that, as is usually the case, hæmolytic streptococci are in part at any rate responsible. A high temperature, rapid pulse, headache, and enlarged tonsillar glands in conjunction with tonsillar exudate may be regarded as sufficiently indicative of the type of infection to justify giving the drug before the result of swab-culture is forthcoming. A fall of temperature by crisis within twenty-four hours is to be anticipated, but treatment should be continued for three days to avoid relapse. Two tablets (0.5 gm. in each) thrice daily is the usual dose for an adult. If the bacteriological investigation proves to be negative for hæmolytic streptococci they should be discontinued. It is futile to administer sulphanilamide for all forms of catarrhal sore throat, and reports without bacteriological findings of recovery from sore throat in three days are unconvincing, for this is the usual recovery period.

A case of streptococcal tonsillitis, spreading cervical cellulitis, and albuminuria with casts but complete recovery under three injections of prontosil was reported. One observer records a number of excellent results following its use for septic parotitis which he met frequently in asylum work. Here again, marked improvement was seen in twenty-four hours. Others refer to patients desperately ill with Ludwig's angina and rigors cured in a few days by sulphanilamide.

It appears from the above and many other instances that the more alarming the condition of the patient the more dramatic will the effects of therapy prove to be.

Streptococcal septicæmia.—The persistence of a high and swinging pyrexia after tonsillitis in association with headache, enlargement of spleen, rapid pulse and often vomiting and diarrhœa usually indicated the presence of streptococcal invasion of the blood stream. Positive blood cultures of hæmolytic streptococci can often be made, yet the prognosis is often good and the fever abates in two or three weeks.

Recovery from its use in a case of streptococcal infection with positive blood culture and various cases presumably of true septicæmia in children cured by the drug have been reported. I have dealt with one septicæmia with positive blood culture of hæmolytic streptococcus with secondary involvement of one knee and both shoulder joints with purulent effusion. Recovery was dramatic, the fever abating in three days and the joint fluid becoming sterile in the same period. Recovery was complete in ten days.

It is cases such as these which raise hopes that the fatalities of post-mortem and operation wounds so tragically familiar to hospital workers will dwindle to insignificance under the power of sulphanilamide.

Streptococcal meningitis and infections of the ear.—The mortality from streptococcal meningitis no matter how acquired has hitherto been appallingly high. Its development as an extension of otitis media and mastoiditis was wellnigh hopeless. It is therefore of especial interest to find convincing reports of recovery following the use of sulphanilamide.

An example of a boy with suppurative otitis media who developed meningitis was reported. The cerebrospinal fluid contained hæmolytic streptococci and much pus: 10 c.cm. of the drug was injected intramuscularly daily and two tablets given by mouth thrice daily.

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The temperature was normal within thirty-six hours of starting treatment and recovery was complete.

A boy with a fracture of the anterior cranial fossa developed a hæmolytic streptococcal meningitis seven days after the accident: 20 c.cm. prontosil were given intravenously and again in eight hours. The temperature fell to normal within twenty-four hours. Two tablets of prontosil album were given thrice daily for a week afterwards.

Perhaps the most striking instance was a female, aged 28, suffering from mastoiditis and streptococcal meningitis. The cerebrospinal fluid contained 3,880 white cells (79 per cent polymorphs) per c.mm. This count rose to 5,181 with a fluid pressure of 440 mm. H_2O, hæmolytic streptococci in the cerebrospinal fluid and a temperature of 105.4°F. 25 c.cm. of fluid were removed and 20 c.cm. of 0.8 per cent sulphanilamide in normal saline injected intrathecally, and 200 c.cm. subcutaneously. Twenty-four hours later the cell count was 1,026, pressure 240 mm., temperature 104°F. Starting on the fifth day of the disease, nine daily consecutive intraspinal injections of 20 to 35 c.cm. of the drug were given. On fifth and sixth days 200 and 350 c.cm. subcutaneously respectively. Orally from 4 to 6 grammes were given from the seventh to twentieth day. On the sixth day of treatment the cerebrospinal fluid was sterile and the cell count 450. The mastoid was not opened until the cerebrospinal fluid was sterile. A mastoiditis was aborted with prontosil.

Erysipelas.—There is now abundant published testimony to the value of sulphanilamide in the treatment of erysipelas.

Three hundred and twelve cases divided into groups for control purposes were reported. In these groups there was an even distribution of factors such as age, duration of disease, severity of infection and associated diseases. Ultra-violet-ray therapy was given to 104 patients; prontosil (red) to 106; U. V. R. plus prontosil to 54; scarlet fever antitoxin to 48. The average case-dose of prontosil to apyrexia was 5 gm.: minimum 1.2 gm.: maximum 15 gm. Cyanosis developed in two. These cases treated with prontosil showed better results than the controls in respect of curtailment of the duration: (1) of local spread; (2) of primary pyrexia; (3) of toxæmia. The fatality rate in prontosil treated cases was 2.5 per cent: that in controls 6.6 per cent.

A few cases treated with sulphanilamide with uniformly good results have been reported.

High mortality from erysipelas in infants under two years of age (70 to 80 per cent) existed until sulphanilamide changed the picture. It has been found that after a series of recoveries from the use of basic prontosil a batch of infants failed to respond. This is ascribed to failure of absorption of the drug, for prompt response followed the use of the HCl salt of the base.

This difficulty is unlikely to arise with the derivative preparations.

Others have treated fifty cases of erysipelas successfully with sulphanilamide and refer in particular to three patients who developed concurrently signs of nephritis in the nature of albuminuria, hæmaturia and granular casts. Recovery was complete. Another patient with chronic nephritis as a legacy from a previous attack of erysipelas developed anasarca, albuminuria of 8 per thousand, blood urea 44 mgm. and gallop rhythm as the result of a second attack. Complete recovery with the exception of 1.5 per thousand albuminuria followed sulphanilamide treatment.

One observer is unimpressed by the action of prontosil in scarlet fever or its complications or in suppurative meningitis but praises its curative effect in erysipelas in infants.

Streptococcal pneumonia and empyema.—Not the least remarkable of the uses attributable to sulphanilamide have been those of streptococcal infections of the respiratory tract.

Recovery of three children aged four years who developed a purulent pleural effusion containing hæmolytic streptococci has been reported. The drug was administered orally. In one child the empyema was a complication of measles and broncho-pneumonia. The temperature fell by lysis and the fluid became clear in a few days in each case. No operation was therefore necessary. In one of the children acute nephritis developed and sulphanilamide was stopped in the fear of aggravating the condition. This produced a relapse in the chest lesion, so treatment was started again with completely satisfactory results. It has since been generally accepted that nephritis does not contra-indicate the use of sulphanilamide.

Two cases of streptococcal empyema presenting thin pus are reported: treatment was started with prontosil tablets by mouth. Later the pus became thick and it was decided to administer 5 c.cm. of prontosil solution intrapleurally with a view to ultimate rib resection. This, however, proved to be unnecessary for in three days the pus was thinner and sterile. This is the first reference to the intrapleural route of administration.

A man suffering from broncho-pneumonia had profuse hæmolytic streptococci in the sputum. On the fifth day of the disease a turbid effusion developed at the left base. This also contained streptococci. Prontosil was given on the eighth and subsequent days for a week, the dosage being 5 c.cm. by intramuscular injection and two tablets thrice daily by mouth. On the second day of treatment the temperature and pulse were lower and fell progressively to normal by the sixth day of treatment. The effusion was absorbed in four days. Cyanosis towards the end of treatment which was continued for twelve days accompanied the orange discoloration of the skin which often resulted from the original prontosil. The paradox of a recovering patient becoming blue was at the time inexplicable but must clearly have been referable to methæmoglobinæmia.

Scarlet fever.—There is no consensus of opinion about the value of sulphanilamide in this disease. It is naturally a difficult investigation to carry out because of the comparative mildness of the disease in the present phase.

It has been reported that the number of scarlatinal patients who developed complications fell from 56 per cent in the 150 control cases to 35 per cent in the 150 treated patients. The disease was arrested in twenty-four hours in 47 cases.

Miscellaneous diseases due to hæmolytic streptococci.—From a perusal of the above it must be clear that any disease attributable to hæmolytic streptococcal infection will probably be controlled by sulphanilamide. Conditions such as cellulitis, infected wounds and peritonitis are examples.

Before leaving the subject of streptococcal infections it should be emphasized that sulphanilamide exerts its beneficial effects only when the hæmolytic streptococcus is at work (-hæmolytic according to some classifications). It has no effect on *Streptococcus viridans,* and is therefore useless in the treatment of bacterial endocarditis in the vast majority of cases. No report has yet appeared on the treatment of a hæmolytic streptococcal endocarditis. One other point is that all observers are agreed that the drug should be given for from four to ten days after defervescence in order to avoid relapse.

DISEASE NOT DUE TO STREPTOCOCCI

Following the acclamation of sulphanilamide as an effective antistreptococcal preparation it was not unnatural that it should be tried out in the most diverse diseases. Up to the present sound claims for its efficacy have been established for the treatment of meningococcal, coliform and probably gonococcal diseases.

Gonococcal diseases.—In view of the close biological relationship between the meningococcus and gonococcus and favourable results in treating diseases of the former sulphanilamide was used in gonorrhœa.

Four divided doses a day with a total of 4.8 gm. daily were given for two days, 3.6 gm. for three days, 2.4 gm. for four to eight days. No other treatment

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was given. The active urethral discharge had disappeared in three cases in one day, in seven cases in two days, in two cases in three days and in two cases in seven days. Two patients gave a positive smear at twelve days. One patient failed to attend satisfactorily. One without discharge but with prostatitis and epididymitis and gonococci in the urine was clear in fourteen days.

Twelve persons with chronic gonorrhœa of one to four months' standing were treated. Ten were cured in seven to twenty-one days. No relapse up to three months. Of four subacute cases one was cured in fourteen days. In three, the second urinary specimen was clear in ten days, but the first had gonococci in it for thirty days. It is suggested that this is due to the greater vascularity of the prostatic and posterior urethra resulting in a higher excretion concentration of the drug than in the anterior urethra. Fourteen patients with acute gonorrhœa were disappointing. Cure of four in fourteen, thirty-five, ten and forty-two days respectively was reported.

Still more recently the results of treatment of 20 acute cases were stated to be disappointing.

Others challenge the above statement and refer to a hundred cases treated with good results. They gave fifteen grains of prontosil album thrice daily for several weeks if necessary, but it is noteworthy that their results were much better when this procedure was combined with urethral irrigation with potassium permanganate. Of twenty-nine patients so treated excellent results were obtained in twenty-one: there were no complications. Frequently the discharge and symptoms were relieved in three days. They report favourably also on the treatment of acute salpingitis and vulvo-vaginitis.

In a private communication I was informed of dramatic recovery of multiple gonococcal arthritis due to the use of sulphanilamide.

Prompt effect in one case of gonococcal vaginitis and two failures were observed. In one patient with ophthalmia a negative smear was obtained after thirty-six hours of treatment. It will be seen that the evidence though hopeful is still unconvincing.

Bacillus coli *infections of the urinary tract.*—Eighteen cases of *Bacillus coli* pyuria in children were treated with prontosil.

The breast-fed babies were given 0.1 gm. thrice daily and the dose raised for older children according to age. Thirteen of eighteen infants were cured outright in from four to eleven days. Three others relapsed but were cured with further treatment. One relapsed in spite of persistence with prontosil. One was a complete failure.

Fourteen cases of pyuria were cured in one to two weeks. Others report cure of all their cases in a few days with a dosage of 0.5 gm. t.i.d. for a week.

There was recovery in a week of eight patients with *B. coli* cystitis after previous failure with hexamine.

Sulphanilamide produces a urine highly bactericidal for most organisms infecting the urinary tract but has no effect in *S. fæcalis.*

Important as these various findings are, it will be of greater interest to learn the effect of sulphanilamide on the chronic urinary infections, especially as to its value in preventing relapse.

Meningococcal meningitis.—Prontosil exerts a protective action against meningococci in mice. If sulphanilamide be given to mice immediately after infection with meningococci it protects them against one million minimal infecting doses. This protection is for groups 1 and 2. It is much less marked if the drug be administered after a delay of a few hours. Furthermore streptococci will not grow in the cerebrospinal fluid of sulphanilamide-protected rabbits. The drug, if given orally, reaches the cerebrospinal fluid in high concentration (1 : 5,000).

A case of meningococcal meningitis which had been treated with serum with no effect is referred to. After ten days of the disease with heavily infected cerebrospinal fluid a 1 per cent solution of the drug was then injected intrathecally (10 to 20 c.cm. daily). The cerebrospinal fluid was sterile within twenty-four hours of the first dose. Recovery was complete.

Four recoveries out of seven cases of streptococcal meningitis as compared with one in fourteen of an earlier series without the drug; good results in erysipelas: no recovery from pneumococcal meningitis or staphylococcal septicæmia and excellent results in erysipelas are also reported. Five patients suffering from meningococcal meningitis were treated. One case had an injection of 0.8 per cent sulphanilamide in physiological saline intrathecally (10 c.cm. less than the amount of cerebrospinal fluid removed); two cases had intravenous injection of the same solution (100 c.cm per 20 lb. of body weight), and the remainder had 0.6 gm. for each 20 lb. per os. Thereafter 0.06 gm. per lb. per twenty-four hours. Treatment was started on the second to the fifth day and lasted four to ten days. In all five cases the cerebrospinal fluid was sterile in twenty-four hours.

Diseases for which sulphanilamide is of doubtful value

One brief reference will be made to various complaints for which sulphanilamide has been claimed on inadequate grounds to be of benefit.

Prontosil is applied in alcohol-acetone solution or as basic prontosil in water and glycerin locally. Good results are reported in the treatment of wounds, eczema, furunculosis, epidermophytosis, erythrasma, sore throats, burns, psoriasis, and as an antiseptic prior to operations. This staggering list suggests over-statement. A limited and unconvincing report claimed that the drug is of use in chronic pemphigus.

I saw temporary striking improvement in four patients with ulcerative colitis: prontosil rubrum was injected (5 c.cm. intramuscularly) daily and two tablets given thrice daily by mouth. On the eighth day a sudden improvement in the nature of the stools was seen and persisted to apparent recovery. All four relapsed and failed to respond to the drug again. Two other cases showed no improvement from the start. Its use in ulcerative colitis is not recommended.

Good results and a great reduction in the number and severity of lymphangitic outbreaks in filariasis can be achieved by the use of sulphanilamide. The rationale is that streptococci play the part of secondary invaders and are really responsible for the lymphangitis, rigors and adenitis.

Undulant fever, arthritis deformans and pneumococcal infections have also been alleged on insufficient grounds to succumb to the magic power of sulphanilamide. Experiments on mice suggest that it protects against typhoid and paratyphoid, but it would be unwise at the present juncture to attempt to base any general therapy on as yet incomplete investigations.

TOXIC EFFECTS OF SULPHANILAMIDE

Certain toxic effects, usually but not always the result of prolonged administration, may arise during or soon after sulphanilamide treatment. These are nausea, colicky abdominal pain, morbilliform and maculo-papular rashes, pyrexia, acidosis, anæmia, methæmoglobinæmia, sulphæmoglobinæmia, and agranulocytosis. The rise of temperature occasioned by the use of the drug though rare is apt to be confusing when it occurs in that it may suggest a relapse of the disease under treatment. I have seen it only after prolonged and large doses and chiefly in the days of prontosil rubrum after repeated injection.

Clinical evidence of acidosis was found in two out of fifty patients treated with sulphanilamide. The CO_2 combining power of the plasma was studied in fifteen further cases. In every instance a consistent though variable fall in this power occurred. The mechanism whereby it was produced is not yet known.

In a series of patients without mishap treated in the course of three weeks there were three examples of hæmolytic anæmia possibly resulting from the use of this drug. Two of the patients had streptococcal sore throats, and one had meningococcal meningitis. The dosage of sulphanilamide employed was very large, *e.g.*, 4.8 gm. per os to start with and then 0.9 gm. four-hourly. Recovery occurred after transfusion with

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citrated blood. Two of the patients after recovery were tested with small doses of the drug to test for idiosyncrasy. No further hæmolysis, however, occurred.

Methæmoglobinæmia and sulphæmoglobinæmia arise quite often during treatment, and are responsible for the cyanosis which may develop rapidly and to a considerable degree. Methæmoglobin is said to be the true toxic product of sulphanilamide, but sulphæmoglobinæmia arises with frequency if sulphates are being taken as well. It is further stated that:—

(1) Administration of magnesium sulphate simultaneously with, or within two or three days preceding, administration of sulphanilamide gives rise, in most persons, to sulphæmoglobinæmia. The formation of sulphæmoglobin takes place very rapidly even after small doses of the drug.

(2) In the absence of sulphates large doses of the drug are well tolerated, but in a considerable proportion of persons doses of 12 to 24 grammes per diem result in methæmoglobinæmia. Some patients may have an increased susceptibility.

(3) The removal of sulphæmoglobin from the blood is much slower than removal of methæmoglobin. The former has been detected six weeks after administration of sulphanilamide ceased. The latter disappears in approximately twenty-four hours.

(4) Spectroscopic examination of the blood is a more delicate means of detecting sulphæmoglobinæmia than clinical observation of cyanosis.

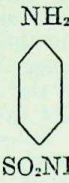
(5) Oxygen is of little value in treatment of severe cases of sulphæmoglobinæmia. If the patient's life is in danger blood transfusion is indicated. In methæmoglobinæmia oxygen appears to be of value.

Regarding the mechanism of the production of sulphæmoglobin it has been pointed out that the majority of cases formerly spoken of as enterogenous cyanosis, *i.e.*, that form which is due to met- or sulphæmoglobin were associated with prolonged or excessive ingestion of drugs derived from aniline or nitrobenzene, *e.g.*, phenacetin, acetanilide, methyl acetanilide, sulphanilamide and nitrobenzene. Nevertheless, there have been some cases of true enterogenous cyanosis for which drugs cannot be incriminated. Exactly how methæmoglobin is formed is not known. Sulphæmoglobin is derived from the sulphide absorbed from the bowel. Thus phenacetin given to dogs may produce methæmoglobin: if given with sulphur, sulphæmoglobinæmia results. H_2S can react with hæmoglobin in the presence of oxygen and the combination is accelerated or catalysed by simple derivatives of aniline or hydrazine. In human beings either a gross excess of sulphide absorption from the bowel or a normal amount in the presence of a catalyst will cause sulphæmoglobinæmia. Experiments *in vitro* have proved that sulphanilamide has such a catalytic action. By taking sulphur and sulphanilamide together, sulphæmoglobinæmia was caused. It is thought that the group C_6H_5N in any drug will facilitate the formation of methæmoglobinæmia.

Saline cathartics particularly should be avoided as a purgative for sulphanilamide-treated patients. For years it has been taught that to produce watery evacuations is to increase microbial growth and unabsorbed food in the colon, and thus toxic absorption from the gut. The saline purgatives are the worst in this respect and thus favour H_2S formation, and indirectly sulphæmoglobinæmia. The sulphur in the sulphate plays no part in this production. The authors advise that during treatment the patient should be on a low residue diet with low ration of eggs (because of high sulphur content). Paraffin may be used as a lubricant, and a simple enema if needed. No phenacetin may be given during sulphanilamide medication. In general it may be accepted that the cyanosis caused by these blood changes suggests much more danger than really exists. Sulphæmoglobinæmia is the least desirable of the two products, and according to some may be of danger to anæmic patients.

Agranulocytosis.—Most of the reports to the effect that sulphanilamide can cause agranulocytosis are unconvincing, because it is not clear that other potentially noxious drugs had not been taken for many weeks previously. Apart from these there are a few instances which appear to establish the possibility of this dangerous sequel of sulphanilamide therapy.

It has been pointed out that amidopyrine, phenacetin, certain gold salts and arsphenamine could produce agranulocytosis, and had in common the benzene ring with an attached amine group (NH_2), which increases the ease of oxidation. Sulphanilamide qualifies for inclusion



A man of 53 years with acute rheumatism failed to respond to salicylates. He was then given prontosil album 0.3 gm. daily for eighteen days. The pyrexia was higher than ever. Treatment was stopped. Four days later agranulocytosis developed. Blood culture which previously gave no growth at this stage produced hæmolytic *Staph. aureus* and *Strept. viridans*. Between 3rd and 21st May, 54 gm. of drug were given. Agranulocytosis, with no warning from successive counts, developed between 20th and 25th May. No salicylates had been given within twenty-four days of the onset. Death resulted.

Only further experience will determine whether in fact sulphanilamide can kill in this manner. At the worst, such an effect will be one of extreme rarity and, in comparison with the thousands of lives this drug will save, sinks into a position of negligible importance.

Sclerosis

By F. E. SAXBY WILLIS, M.C., M.D. (Lond.), M.R.C.P. (Lond.)

(Abstracted from the *Medical Press and Circular*, Vol. CXCVI, 1st June, 1938, p. 463)

IN 1904, Marchand suggested that the term atherosclerosis should be used to include all the various types of arterial degeneration. Ludwig Aschoff more recently has put forward the idea that all the types are the result of essentially the same process, but that different forms of stress determine the incidence of the degeneration on different groups of vessels. According to these groups, four main types of sclerosis are recognized; these are:—

1. Nodular (atherosclerosis).
2. Senile sclerosis (decrescent or involutionary).
3. Arterio-capillary sclerosis (the diffuse hyperplastic sclerosis of Jores).
4. Mediacalcosis (Monckeberg type).

Aschoff in his introduction to *Arteriosclerosis*, edited by Cowdray, summarizes the changes that take place in the degeneration and ageing of arteries and arterioles as a disturbance which manifests itself by deposits of the most varied kinds in the walls of vessels which have been impaired by the process of ageing with resulting deformation of the lumen and brittleness of the walls. He compares these changes with those in senile arthritis and attaches particular importance to the changes in the cementing matrix, both in joints and arteries, that go on during life and increase with advancing age. He points out, however, that mere ageing of vessels does not constitute sclerosis. The latter is characterized by fatty degeneration and calcification, and to produce these other factors are necessary. What these other factors may be is a problem which is exceedingly complex, as many different factors, in addition to the natural ageing of tissues, have been shown to play a part in its production. Recent biochemical research on fat metabolism in its relation to lipoidal degeneration of arterial

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walls, the production of the latter by cholesterol feeding in animals, and most recently by other sterole bodies (benzyl esters) obtained from ovarian secretion seems significant.

The adrenal glands are a storehouse of cholesterol and in conditions of endocrine enbalance presumably the latter may flood the circulation and play a considerable part in the production of sclerosis.

ÆTIOLOGICAL FACTORS

Age.—The ancient dictum that a man is as old as his arteries is probably an inversion of the truth. Sclerotic changes in arteries are found in most bodies over the age of 45, and these changes are more and more marked as age advances; they do occur, however, in younger people, and Monckeberg's figures quoted by Aschoff and Dungal are of interest in this connection. In autopsies on fallen soldiers, all cases over the age of 40 showed atherosclerosis, and under the age of 20, 36 per cent. Dungal finds only very slight sclerotic changes in most post-mortem bodies in Iceland, even up to 70 years of age. It would seem therefore that the process of ageing of tissues, which is essential to the production of sclerosis, has a different age incidence, according to the conditions under which a person lives. Geoffrey Evans states that arteriosclerosis is common after the age of 45 and that there is a familial liability to the arteriosclerotic disease in particular arteries, *e.g.*, coronaries, and that the disease may determine death at approximately the same age in many members of a family. He states that sclerosis is uncommon in young people unless associated with kidney disease.

Heredity seems to play a big part in the ætiology of sclerosis, as it does in longevity.

Sex.—'The statistics as regards sex incidence are unsatisfactory to such a degree as to warrant very limited conclusions'. (Sydenstricker.) It would appear that *marked* arterial thickening is more common in males than in females and that clinical impairment of function as a result of sclerosis is also more common in men. The ratio varies at different ages and is given thus by Sydenstricker:—

Age	..	20–30	30–40	40–50	50–60	60
Ratio	..	2.0 : 1	1.3 : 1	1.1 : 1	0.94 : 1	1.0 : 1

(Male : Female)

It will be noted that there is a rise in female incidence after the menopause.

Race and climate.—Racial and climatic conditions seem to have a considerable effect on the incidence of sclerosis; it is said to be frequent and early in onset amongst Jews, it is relatively uncommon amongst the Chinese and Japanese, the white and coloured population of the United States show little difference in the incidence of cerebral and nephritic types of arteriosclerosis, but heart disease is only three-quarters as common in the blacks as it is in the whites. Climatic conditions are discussed by Dungal and he states that both atheromatosis (lipoid infiltration) and atherosclerosis (lipoid infiltration plus calcification) are rare in Iceland as compared with the figures given for the rest of Europe and America. He associates this with the fact that the iodine content of the food and soil of Iceland is high and that the diet of the Icelanders is chiefly fish. The average weight of the thyroid gland in Icelanders is about half that in U. S. A. and Germany, and this also he considers is a result of the high iodine intake.

Occupation.—Hard physical work does not of itself produce sclerosis; it may, however, determine the incidence of the latter in various parts of the body, as for instance in the coronary arteries of athletes and the arteries of the limbs in manual labourers. Marked arteriosclerosis is nearly twice as common in metal workers, cloth cutters, plumbers, tailors and carpenters as in business (office) workers and domestic employment.

Diet.—The relationship of diet to arteriosclerosis is one which has attracted the attention of clinicians for many years, chiefly on the assumption that excess of animal food leads to degenerative arterial change. Investigations in animals, however, show that vegetarian diets may be associated with vascular reaction and calcification. This is true in birds, but it is noteworthy that the parrot family, which are both seed and meat eaters, have a marked longevity but tend to reproduce the human type of sclerosis. The work of Anitschkow and others on the production of sclerosis by feeding with cholesterol is significant. This and the association of gall bladder disease and cardiovascular degeneration in human beings suggest that excess of fats, rather than of proteins, is the chief factor in the dietetic production of sclerosis. It would seem that diets relatively high in protein have little effect on the production of sclerosis of the nodular or the decrescent type. In the presence of renal arteriosclerosis excessive nitrogenous intake is obviously likely to aggravate the condition. Alcohol *in moderation* appears to have little effect on the development of sclerosis, and this gives some justification for the cynic's assertion that 'more people die from overeating than overdrinking'. Dufour suggests that alcohol may have some beneficial effect as being a solvent of cholesterol. The inclusion of fish in the dietary of sclerotics seems to be indicated owing to its high iodine content. Cereals have never been shown to produce sclerosis apart from those with a high starch content which tends to produce adiposity. Eggs, on the other hand, have a high cholesterol content and in common with other substances rich in vitamin D, were shown by Kreitmair to produce sclerotic changes in animals. Wilton suggests that deficiency in vitamin C may cause the characteristic changes of sclerosis. The experimental work in this connection seems to point to sclerosis being in some cases a deficiency disease.

ENDOCRINE FACTORS

Thyroid.—The work of Dungal on the relative weight of thyroid glands in Icelanders in whom sclerosis is uncommon, as compared with the average weight of those in Germany, America and other countries in which sclerosis is frequent, suggests that there is some definite relationship between the activity of the thyroid gland and the incidence of sclerosis clinically. It may be noted that the administration of small doses of thyroid extract to sclerotics of the hypertensive group often has a beneficial effect both on their symptoms, their weight and blood pressure.

Adrenals.—The adrenal cortex by raising blood pressure may produce sclerosis; it has also been proved that adrenaline injection in animals produces mediacalcosis even when the blood pressure is controlled by nitrites. There is experimental evidence that the adrenal cortex is an important depository of cholesterol over which it may have a regulating function.

Pituitary.—Relationship of the pituitary gland to sclerosis has been described in acromegaly (Zondek). In view of the blood-pressure-raising properties of the posterior lobe and the complexity of the pituitary secretion, it seems likely that there may be important, if indirect, associations.

Male sex glands.—The hormone, testosterone, belongs to the sterole group and can be derived synthetically from cholesterol (Dodds). It is probable that it may have some bearing on the development of senile sclerosis (with which prostatic enlargement is so often associated), but this question has not been fully explored.

Ovarian.—The occurrence of raised blood pressure, so frequent at the climacteric and the increased incidence of sclerosis in females from this time onwards, suggests that the ovarian secretion has a relationship to sclerosis. Recent work by Dodds and others on sterole metabolism is suggestive, particularly as the steroles have a chemical relationship to cholesterol, which is one of the most complex members of the group, which also includes the ovarian hormones.

Pancreas.—The relationship of sclerosis to diabetes and the incidence of the former on the pancreatic

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vessels suggests an association, particularly in the elderly stout type of diabetic with a raised blood pressure and evidence of cardiovascular degeneration. Coronary disease is said to be present in 50 per cent of diabetics over 50 years of age.

Clinical features.—It will be obvious that with so many variations in distribution of sclerosis the clinical picture will vary, not only with the type of degenerative change, but with the anatomical incidence. In a short review such as this, it is obviously only possible to give the briefest of sketches of the symptoms and signs that may be found in the four types which have been described.

Taking the senile or decrescent type first, this may be present for years without symptoms other than those of premature ageing, such as wrinkling of the skin, greying of the hair, development of the arcus senilis, and vague 'rheumatic' pains and muscle cramps. On examination, little more than thickening and tortuosity of the brachial, radial and tibial arteries may be detected and there may be no increase in blood pressure. The muscle cramps may be severe and amount to intermittent claudication, with resulting muscle weakness and inability to walk more than a short distance. Where the smaller branches of the peripheral arteries are affected coldness and numbness of the toes and feet may be warning of the approach of senile gangrene. The latter is more apt to occur if there is coincident diabetes, which is found in about half the cases of gangrene, according to the statistics of Eliason and Wright.

Nodular sclerosis is particularly liable to affect the aorta and its branches, giving rise to spasmodic attacks of thoracic or abdominal pain, although it is remarkable how few symptoms may result from most extensive atherosclerosis of the aorta. The latter has been seen by the author in the bodies of men as young as 35.

In the heart, sclerosis of either the senile or the nodular type is prone to affect the coronary arteries, giving rise to angina of effort, coronary thrombosis and arrhythmia due to myocardial degeneration, presenting itself as ventricular extrasystoles, auricular fibrillation or various grades of heart block. The heart as a rule shows hypertrophy of the left ventricle (shown by *x*-ray examination to be of the 'boot-shaped' type associated with coronary disease). Electrocardiography helps in the diagnosis of ventricular preponderance and in defining cardiac irregularity and coronary disease.

Cardiac asthma may result from atherosclerosis of the coronary or pulmonary arteries, and will cause dyspnœa, orthopnœa, bronchitis and hæmoptysis, particularly in the presence of congestive pulmonary œdema. The symptoms that arise from sclerosis of the arterioles of the kidneys, brain, pancreas, spleen and gastro-intestinal tract vary according to the disturbance of function in the organ concerned. In the kidney shrinkage and fibrosis result with impairment of function, hypertension and hæmaturia. The symptomatology simulates that of chronic interstitial nephritis. Hæmaturia may be a distinguishing feature in sclerosis.

Sclerosis of the cerebral vessels causes such symptoms as headache, giddiness, sleeplessness, confusion of memory or temporary muscular weakness or sensory loss or paraæsthesia. No doubt these transient pareses or paraæsthesiæ are due to angiospasm as a rule, but thrombosis in narrowed arterioles or hæmorrhages may also result from sclerosis with resulting paralysis. Mental deterioration and 'senile decay' often result.

Retinal arteriosclerosis is commonly associated with these cerebral manifestations; as seen by the ophthalmoscope the retinal arteries are of the 'silver wire' type, indenting the veins and resulting in a patchy retinal atrophy.

Hæmorrhages are often seen. Aural symptoms such as tinnitus and deafness are often associated.

Sclerosis of the gastro-intestinal circulation may give rise to abdominal pain suggestive of gastric or duodenal ulcer (particularly when accompanied by hæmatemesis or colic and melæna). Pancreatic sclerosis may cause diabetes, or in hæmorrhage crises may simulate acute pancreatitis.

In a case recently under the author's care, admitted to hospital with acute abdominal pain and collapse, a pulsating swelling in the left inguinal region could be traced up into the abdomen. The subsequent autopsy showed a dissecting aneurism of the common iliac artery which had ruptured and caused a large retro-peritoneal hæmatoma. Atherosclerosis was limited to the iliac artery. There was no history of antecedent illness referable to the lesion found.

It will be realized from this brief account of the symptomatology of sclerosis how widely divergent the latter may be in its results. The symptoms of its causation or development may be equally varied. Take, for example, the association of arteriosclerosis, cardiovascular degeneration and gall bladder disease, the literature of which is quoted by Laird. This clearly indicates the importance of investigating the condition of the cardiovascular system before any surgical operation is performed. It also gives clinical verification of the association between sclerosis and abnormal cholesterol metabolism.

Treatment.—Sclerosis of itself is a pathological condition rather than a clinical entity, and many cases do not require treatment and are not likely to be benefited thereby. When one so often sees patients in the seventies and eighties who have evidence of well-marked arterial thickening and have gone through life with very little illness, it makes one hesitate before putting restrictions on their life. As Sir Clifford Allbutt advised, temperance rather than abstinence should be observed, and in cases of this kind it is particularly applicable. What is really needed is treatment of the symptoms which may result from the thickening of arteries and the effects it has on the organs and limbs which they supply.

Treatment of sclerosis can therefore be divided into three kinds:—

1. Preventive.
2. Treatment of the arterial disease itself.
3. Treatment of symptoms referable to the various parts of the body affected.

1. *Preventive.*—We have so little exact knowledge as to the cause of sclerosis that anything in the nature of prophylaxis must be largely experimental, at the same time in families in which sclerosis and vascular calamities have been common care in diet and exercise should be enjoined, and a periodical examination of such patients over the age of 40 is advisable. Where any signs of commencing sclerosis are detected certain alterations in diet are indicated, particularly starchy foods such as pastry and potatoes, and foods rich in vitamin D and cholesterol content should be restricted, regular exercise encouraged and in some cases periodical visits to a spa may be very helpful. The regime at Vichy, for instance, includes opportunities for practically every sort of exercise, according to the capabilities of the patient, and the same is more or less true of our own spas in the British Isles. Inclusion in the diet of vitamin C in the form of fruit, salads, etc., should be advised and iodine in some form should be given; more fish in the diet may meet this requirement, and of the spas, those where the water is rich in iodine are preferable.

2. *Treatment of the arterial disease itself.*—In hypertensive sclerosis we are dealing with a separate group calling for special diet and other measures directed to keeping the blood pressure within safety limits. Sedatives such as bromide, chloral and that useful compound of caffeine and barbiturate, theominal, are helpful. Small doses of thyroid are indicated where there is any tendency to subthyroidism. Iodine of potash or iodine also are indicated, particularly in bronchitic subjects. Balneological treatment, as carried out in spas, is useful in reducing weight. Diuresis should be promoted, particularly where there is any tendency to œdema, by spa waters or in more advanced cases by diuretin or mercurials, such as Guy's pill, or where there is œdema with a normal renal function intramuscular mercury such as Salyrgan is helpful.

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Regular bowel action should be promoted by an occasional dose of mercury and a daily saline in the morning. Inclination as regards diet may be followed provided that no gastric symptoms are present and that protein intake is limited in nephritic cases and carbohydrate intake in diabetic cases and obesity. Alcohol is allowed in strict moderation, but where hypertension is marked it must be forbidden. Regular sleep is essential and sedatives may be necessary, such as bromides and luminal, and where signs of commencing heart failure are present digitalis is indicated in most cases.

3. *Treatment of symptoms referable to the various parts of the body affected.*—Symptomatic treatment divides itself into the treatment of pain, whether cardiac, peripheral, cephalic or abdominal, the treatment of hæmorrhage, whether epistaxis, hæmoptysis, hæmatemesis, melæna or cerebral, or of failure of function of affected organs.

For cardiac pain in hypertensive cases, nitrites, of which amyl nitrite and liq. trinitrini are the most useful, are indicated. In coronary thrombosis morphia is not to be spared. In peripheral pain, such as intermittent claudication, pancreatic extracts such as Padutin and acetylcholine have their advocates. For cephalic pain and restlessness, barbiturates such as the sodium salt combination with caffein are useful. For hæmorrhage, when associated with hypertension, venesection may help. Failure of function, as in the pancreas or kidneys, calls for appropriate treatment by correct dieting, reduced carbohydrate intake, with or without insulin in the former, and reduced protein and saline intake in the latter. Diuretin assists excretion. For intestinal symptoms, regular attention to bowel action by salines, vegetable laxatives and occasional calomel are necessary, with appropriate dieting. For the headache and other symptoms of hypertensive encephalopathy, occasional venesection or even lumbar puncture may be indicated. Injection of 20 per cent solution of magnesium sulphate intramuscularly is recommended by Fishberg in such cases. For cardiac failure, as after a coronary thrombosis, digitalis is helpful in restoring function.

Summary.—To sum up, sclerosis is a degenerative process accompanying the ageing of arterial tissue which is aggravated, if not induced, by metabolic enbalance, of which the chief manifestation is lipoidal infiltration and calcium deposition in arterial walls. These changes vary in different organs of the body, according to the size and character of the artery involved and its distribution. There is reason to think that the chief cause of the metabolic disturbance which is responsible for these changes is in the fat metabolism of the body, as evidenced by abnormal cholesterol deposition and consequent lipoidal deposits in the arteries and arterioles. Such disturbance may be produced by endocrine disturbance or dietetic errors. Its clinical manifestations and treatment depend on the type of degeneration, of which there are four main classes, and on its anatomical distribution.

Two Years' Observation on the Use of Atebrin as a Prophylactic Agent in Malaria

By ROY A. HILL
and
MELVIN H. GOODWIN

(Abstracted from the *American Journal of Tropical Medicine*, Vol. XVIII, July 1938, p. 339)

IT was shown in a previous article that atebrin and quinine were effective in reducing the number of active cases of malaria on a 16,000 acre plantation. As stated in the preliminary report, the inhabitants were permanently situated in the area and for the most part were engaged in agricultural activities. For various reasons anopheline control was out of the question.

The general plan of the programme was to obtain a blood parasite index at the beginning and close of each malarial season, and to observe by periodic blood examinations the incidence of malaria in the prophylactic group as contrasted with that of a control group not under medication. The time at which the initial and final blood parasite surveys of the prophylactic period were made was determined by seasonal-climatic conditions. Examinations between these two surveys were made upon the evidence of clinical symptoms, and if plasmodia could be demonstrated the patient was treated. In 1936 and 1937 the initial smears were made during the first week in May. In 1936 the survey was concluded and specimens collected the last week in September. In 1937 the last smears were collected between 13th and 20th December. The positive cases disclosed by the mass sample at the close of the season were not included in the percentage of infections for the season since this sample was taken with complete disregard of clinical symptoms. It was necessary that an initial smear be obtained from every person in the survey, and at the close of the season an attempt was made to examine the blood of every person. Often this was not practical, but a large random sample was collected. Table I indicates the size of the sample and the results of the examination of each group of smears.

In the programme for 1936, 337 of the 350 persons (table 1) were included in the project. These were divided into three intermingled groups, the first composed of 109 persons was given 1½ grains of atebrin, three times weekly, the second group of 108 persons received 10 grains of quinine daily, and the third group of 120 was used as a control and received bicarbonate of soda capsules only. The doses given above are for adults. Children were given appropriately smaller doses. All individuals showing plasmodia in the peripheral blood at the beginning of the survey were treated, thus rendering them parasite free before they were assigned to any group. Weekly visits were made by a competent registered nurse and upon evidence of any symptoms, a thick blood smear was obtained.

TABLE 1

Blood parasite indices, including individuals under prophylactic regime and untreated control

Year	Spring		Autumn	
	Number examined	Per cent positive	Number examined	Per cent positive
1936	350	16.9	190	8.4
1937	374	1.1	239	0.3

The marked reduction in malarial incidence after the season of greatest malarial transmission in each year can only be due to the use of prophylactic drugs during the summer season.

Table 2 gives the infections in the various groups during the season of 1936; table 3 gives the percentage of infections in the various groups for 1936 and 1937.

The writers are aware of the fact that the control group, in such proximity to the prophylactic groups, could not give a fair indication of the malarial infection since, granting that the prophylactic measures were effective, infection normally obtained from the persons in the prophylactic areas would not be available. For this reason at the outset of the 1937 season all persons residing in the entire area used in 1936 were placed on prophylaxis. There was an increase of 37 persons in the prophylactic group due to a few new families that had been transferred to this area. A control area was selected, approximately twenty miles removed from the prophylactic area, which contained 339 persons. It was impossible to make as thorough an examination as was desired of persons residing in this area; however, the conditions in the control area simulated closely those in the prophylactic area. The exposed water area was

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about the same and the anopheline density paralleled very closely that of the prophylactic area.

TABLE 2

Clinical cases of malaria by months (1936)

Month	ATEBRIN GROUP (109 PERSONS)		QUININE GROUP (108 PERSONS)		CONTROL GROUP (120 PERSONS)	
	Number of cases	Per cent	Number of cases	Per cent	Number of cases	Per cent
June ..	1	0.9	2	1.9	18	15.0
July ..	1	0.9	2	1.9	12	10.0
August ..	0	0.0	0	0.0	5	4.2
September ..	0	0.0	2	1.9	3	2.5
October ..	0	0.0	0	0.0	0	0.0
TOTAL ..	2	1.8	6	5.6	38	31.7

TABLE 3

Per cent infection by groups in 1936 *and* 1937

Year	Control group	Atebrin group	Quinine group
1935*	58.0	..	..
1936	31.7	1.8	5.6
1937	5.3	0.3	..

*No systematic blood survey was made during this year. This figure indicates the number of clinical cases that required treatment.

Table 4 gives the results of the 1937 work and is indicative of the infection for that year.

The writers are at a loss to explain the very low malarial index for 1937 since they do not believe that cyclic variations are altogether responsible. No mosquito control measures had been conducted in this area, and, so far as is known, there has been nothing else that would have influenced the malarial morbidity. It is also interesting to note that the infections occurring during 1937 were in the months of August, September, and October, with a peak in October; while in 1936 the majority of infections occurred in June, July, and August, with a peak in June. The writers do not believe that the slight geographical separation of these two areas could have accounted for this difference. Another locality under observation, however, which appears to be topographically similar, but distant about 75 miles to the north-west, showed a parasite index of 14 per cent in the control group; while an area in the same vicinity on atebrin prophylaxis, containing 933 persons, showed a parasite index of less than 0.1 per cent.

TABLE 4

Clinical cases of malaria by months (1937)

Month	ATEBRIN GROUPS (374 PERSONS)		CONTROL GROUPS (339 PERSONS)	
	Number of cases	Per cent	Number of cases	Per cent
June ..	0	0.0	0	0.0
July ..	0	0.0	0	0.0
August ..	1	0.3	3	0.9
September	0	0.0	3	0.9
October ..	0	0.0	7	2.1
November	0	0.0	0	0.0
December	0	0.0	0	0.0
TOTAL ..	1	0.3	13	3.8

In malarial prophylaxis the ideal objective is, of course, to remove the source of the infection for the vectors. In consideration of the fact that most of the malaria in this locality is caused by *Plasmodium falciparum*, plasmochin was given at the close of each season at the time when the final blood smears were collected. Plasmochin was also made available to those upon whom no final blood examination was made. The adult dose was 1/6 grain three times a day for seven days. Infant dosage was reduced appropriately. Table 5 shows the number of patients infected with gametocytes and schizonts during the past two years of this study.

It is worthy of note that in May 1936 there were five persons who exhibited only gametocytes and nine who exhibited both gametocytes and schizonts in the peripheral blood. At the close of the season the sample indicated that there were no persons with gametocytes only and only three persons whose blood showed both gametocytes and schizonts. In May 1937 57.3 per cent of persons treated with quinine subsequently showed parasites in the peripheral blood while only 14.8 per cent of those treated with atebrin again became positive.

TABLE 5

The relative frequency of schizonts and gametocytes in all examinations (1936 *and* 1937)

Date	Number of persons examined	FORM OF PLASMODIA			
		Schizonts	Gametocytes	Schizonts and gametocytes	Total positive
May 1936 ..	350	45	5	9	59
September 1936	190	14	0	3	17
May 1937 ..	374	4	0	0	4
December 1937 ..	239	1	0	1	2

Among the total of 82 persons with parasites at one examination or another, there were 18 gametocyte carriers (22 per cent).

TABLE 6

Results of treatment of positive cases in control groups with quinine and atebrin

Month	PATIENTS TREATED WITH ATEBRIN		PATIENTS TREATED WITH QUININE	
	Initial infections	Relapse or reinfections	Initial infections	Relapse or reinfections
June ..	3	0	15	1
July ..	6	0	6	7
August ..	5	0	0	2
September	3	2	0	2
TOTAL AND PER CENT.	17 (45)	2 (14.8)	21 (55)	12 (57.3)

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We have no way of determining whether these secondary cases were due to relapse of the first infection or to reinfection.

No gametocytes were observed in the first examination. At the close of the work in 1937 only one person was found whose blood contained both gametocytes and schizonts.

No effort was made to distinguish in the tabulation between the two species of malaria observed in this experiment since 92 per cent of all positive cases were *Plasmodium falciparum* and only 8 per cent *Plasmodium vivax*.

As positive cases were discovered in the control group they were treated by one of two methods, the short course, quinine method as outlined by Bass, or with atebrin, 1½ grains three times daily for five days. Table 6 gives the number of cases treated by each method and the reinfections or relapses following treatment with each. The authors propose to draw no conclusion from these data, but the length of time that infection occurred after treatment with atebrin is worthy of note.

DISCUSSION AND SUMMARY

In the present report 1,646 persons were under observation to determine whether or not a suitable method of drug prophylaxis was available for use in a highly malarious section of Georgia and Florida. In the area where these studies were conducted mosquito control measures were objectionable and in many cases impossible due to the topography. Initial blood smears in the first area indicated a blood parasite index of 19.6 per cent. This has been reduced to 0.3 per cent over a period of two years. Atebrin proved to be the most successful prophylactic agent, although quinine seemed to exert a helpful influence in reducing the malarial incidence. The co-operation of patients taking quinine was difficult to obtain and in a few cases it was necessary to discontinue medication because of idiosyncrasies and toxic reactions. No toxic reactions to atebrin were observed. After the administration of both atebrin and plasmochin to persons residing in the prophylactic areas, the number of malarial carriers and cases exhibiting both gametocytes and schizonts was materially reduced. Due to the natural variations of malarial intensities caused by fluctuations in climatic conditions these prophylactic experiments should always be continued over a period of several years to furnish the maximum amount of reliable information.

The Trade in Secret Remedies

(From the *British Medical Journal*, Vol. I, 4th June, 1938, p. 1213)

THE author and publishers have done a notable service in issuing a sixpenny monograph on *Patent Medicines* for the ordinary reader. Those who know anything of the matter realize, as Professor A. J. Clark does, the reluctance of the Press to deal with it. For the first time, if we except the *Secret Remedies* and *More Secret Remedies* of the British Medical Association—now long out of print and in any case coming from a source suspect in many eyes—the public has the opportunity of learning the facts about this trade. It can also learn why Parliament and the Press have been inactive in dealing with a subject which might be thought to offer both of them a fine opportunity for that service to the public which they presumably exist to give. As Professor Clark says, 'Politicians who depend on popular votes simply dare not offend the Press, and still less dare the Press offend the advertiser upon whom it is entirely dependent for its existence'. For this statement facts and figures are given which deserve careful attention. The trenchant report of the 1914 Select Committee of the House of Commons on Patent and Proprietary Medicines is effectively quoted, and Professor Clark has some mordant remarks on the extraordinary 'luck' that has favoured the Press and the trade in avoiding Parliamentary action. He does full justice to the ingenuity of the manufacturers and advertisers of secret remedies and to their astuteness in changing their methods with changing times and fashions. He notes and condemns the present fashion which often takes the form of an appeal to fear as well as to ignorance. He realizes, however, that there is a legitimate field for some of these remedies, and that the best of our newspapers now exclude the worst forms of advertisement. In spite of progress in this direction (in which the British Medical Association and its *Journal* have been active if unobtrusive factors) he was able to find in one recent Sunday paper 'a cure for epilepsy, a drug that had cured mitral disease of the heart, varicose veins, piles, eczema, rheumatism, and neuritis, and, finally, a drug recommended for hay fever, asthma, malaria, influenza, and insomnia, in addition to the relief of most forms of pain'. Evidently the appeal to 'the invincible credulity of the public' pays.

Professor Clark welcomes the growing practice of publishing a formula, but it is doubtful whether this change, which avoids payment of stamp duty, protects anybody. To the average man a chemical formula means nothing. There is, however, one change in the situation not mentioned by Professor Clark which seems likely to do something to eliminate the more glaring abuses of patent medicine advertising. The association which includes the proprietors of many of the most advertised remedies has adopted the criteria included in the mild Medical and Surgical Appliances (Advertisement) Bill of 1936, which was 'talked out' in the House of Commons. The advertisements of all members of the association must conform to these criteria. This is welcome, if belated, evidence of the desire of the trade to reform itself. Professor Clark is rightly severe on the law, which, as he states and proves, shows a remarkable leniency towards the vendors of quack medicines, in strong contrast with the severe penalties to which those who misrepresent the character of ordinary foods and drugs are liable. In his opinion the medical profession cannot be held blameless in this matter. He points out among other things that reputable drug firms, by adopting some of the methods of the baser members of the patent medicine trade, have proved that doctors can be induced to use and prescribe expensive proprietaries though exactly the same drugs can be bought for less than a quarter of the price.

The Select Committee of 1914 found what the medical profession knew only too well—that there was a large and increasing sale in this country of patent and proprietary remedies and appliances, and of medicated wines. It grouped these widely differing remedies into '(*a*) genuine scientific preparations; (*b*) unobjectionable remedies for simple ailments; and (*c*) many secret remedies making grossly exaggerated claims of efficacy, causing injury by leading sick persons to delay in securing medical treatment, containing in disguise large proportions of alcohol, sold for improper purposes, professing to cure diseases incurable by medication, or essentially and deliberately fraudulent'. The third class of nostrums, said the Committee, constituted a grave and widespread public evil calling for new legislation rather than amendment of the existing law. In August 1920, when the Ministry of Health was a new thing and Lord Addison was Minister, a Proprietary Medicines Bill was introduced into the House of Lords 'to regulate the manufacture and sale of certain medicines and surgical appliances, and for purposes connected therewith'. The object of this Bill, introduced by Lord Astor, then Parliamentary Secretary to the Ministry of Health, was to give effect to the recommendations of the Select Committee; but it struck at powerful vested interests and came to nothing. Professor Clark's little book may be strongly recommended. We shall be interested to see whether it has any better luck in the lay press than other attempts to open the eyes of the public have had. It deals with a matter which gravely affects the health of the public—not to mention the public's belief in its own intelligence.

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Emergency Treatment in Asthma (Asthmatic Crisis)

By G. L. WALDBOTT, M.D.

(Abstracted from the *Journal of the American Medical Association*, Vol. CX, 30th April, 1938, p. 1423)

IN the treatment of allergic asthma one is occasionally confronted with a serious emergency which has received little attention in recent textbooks. Its clinical picture is characterized by severe collapse with constant extreme dyspnœa to the point of exhaustion. Some authors refer to this condition in speaking of 'status asthmaticus'. Others have termed it 'intractable asthma', thus indicating the inadequacy of the generally recognized methods of treatment. One has recently called this condition 'asthmatic crisis'. This probably is the most appropriate term. It implies that this condition results either in death or in at least a temporary amelioration of the asthmatic condition.

Concerning its onset, Clarke states that the asthmatic crisis usually climaxes a chronic state of asthma; but it may also occur during a series of acute asthmatic attacks. On the basis of its occurrence in an individual who has previously been suffering from asthma, it is possible to draw a definite line distinguishing it from allergic shock. The latter condition would in every other respect be identical with the asthmatic crisis were it not possible to arise in any type of other sensitization besides asthma.

MECHANISM

Because of this close relationship, certain data obtained on the origin of allergic shock will aid in the understanding of the asthmatic crisis. The syndrome of allergic shock, it should be borne in mind, results, firstly, from extreme sensitivity, secondly, from an excessive amount of an antigen or the simultaneous absorption of several antigens to which sensitivity exists or, thirdly, from too sudden absorption (intravenous) of a dose of antigen which ordinarily would not produce shock. The manifestations of allergic shock depend largely on what organs have previously been affected. In the most common instance of allergic shock, namely, the 'constitutional reaction' in a hay fever patient after an injection of an excessive dose of pollen extract, the skin and the upper respiratory tract are primarily subject to the allergic lesion, namely, the weal; but practically any other organ may also be affected. In patients with chronic asthma, however, the sudden influx of an excessive amount of injected antigen affects, primarily, the pulmonary tissue, causing severe asthma without the association of urticaria, nasal and conjunctival symptoms which are otherwise common. The same is true if the routes of entry of the antigen are other than by injection. Thus the asthmatic crisis can be considered as allergic shock in a patient whose 'shock organ' has previously been the lungs, because he had been suffering from asthma.

Concerning the sources and the clinical manifestations of allergic shock induced by means other than injections, data on thirty-nine cases were collected through an inquiry among allergists by Ascher and myself. Some of the correspondents hesitated to differentiate between the asthmatic crisis and allergic shock and therefore included instances of both conditions. Asthma was present in all but two cases. In six, no other manifestations were noted; asthma and urticaria occurred in eighteen; asthma and gastro-intestinal symptoms such as vomiting and diarrhœa in three; asthma with urticaria and gastro-intestinal symptoms in eight; asthma and convulsions in two. In fifteen patients, ingestion of food was responsible, egg and sea-food being the most common antigens. In five cases the ingestion of drugs (acetylsalicylic acid in four of them) caused allergic shock. In nine cases the inhalation of animal emanations and foods were responsible. In two instances contact of the skin with food was the causative factor, and in five cases contact with other substances was responsible. Sensitization to cold produced shock in two patients, and heat affected one person. In this group there were thirteen females and twenty-six males; ten persons were above the age of 15 and twenty-nine were below.

PATHOLOGY

Before I discuss treatment I shall refer briefly to the mode of death in these cases. It is generally agreed that death in allergic asthma is due to obstruction of the bronchi by thick tenacious mucus that is formed during the course of an attack. This obstruction results in asphyxiation. The earlier writers on the pathology of asthma have referred to the marked bronchospasm which may or may not, in itself, be sufficient to accomplish complete bronchial obstruction by narrowing the bronchial lumen. Relatively less common is death due to the formation of œdema in the alveolar spaces, which was described as a characteristic lesion in allergic shock and which was also the outstanding finding in asthma of short duration.

Another less frequent mode of death in asthma is the development of areas of bronchopneumonia. They may result from infection of atelectatic lesions induced by the obstruction of small bronchi or they may represent a secondary infection of œdematous areas. Concerning the possibility of cardiac death as the result of asthma, there has been considerable discussion in the literature. Most authors agree that the heart plays a minor, if any, rôle in the production of death in allergic asthma.

TREATMENT

Recent publications on the therapy of the asthmatic crisis deal primarily with the utter hopelessness of our therapeutic efforts. Certain measures are proposed by which the authors induced cessation of seizures. One advocates the rectal administration of ether and oil. Another suggests that tribromethanol in amylene hydrate be given rectally. Others recommend the inhalation of carbon dioxide, and that of helium and oxygen. Very little is said as to how the general management of such cases should be conducted. A discussion of this problem, however, is of great importance because, in the opinion of many, death in asthma can often be directly attributed to certain therapeutic measures.

In accordance with the mechanism and the pathology of the asthmatic crisis, four principles are outlined which can be regarded as the key for successful treatment: (1) extreme caution in introducing into the system any substance that may be harmful to the patient; (2) elimination of substances which may have harmed him regardless of whether or not positive skin reactions to these substances have been obtained; (3) symptomatic relief to counteract existing cyanosis, to allay cough, to support the nutritional state and to afford rest and relaxation; (4) support of the patient's specific resistance against those antigens to which he is sensitive (hyposensitization).

1. *Avoidance of harmful antigens.*—The results of our inquiry indicate the danger of the introduction of foods and drugs which may aggravate the situation. Foods that have not been eaten for a long time were found to be particularly harmful, especially if taken in large quantities. The danger of acetylsalicylic acid has been sufficiently stressed in the literature. Quinine, phenolphthalein and acetanilid deserve, in my experience, second consideration among drugs. The intricacy of this problem is illustrated by pointing out that the same drugs, especially acetylsalicylic acid, are likely to give relief in certain patients. On the other hand, the most severe attacks of asthma that I have had occasion to observe occurred shortly after the taking of acetylsalicylic acid. Indeed, this has been so striking an experience that the fact that an attack was extremely severe has led me, on two occasions, to the correct conclusion that this drug had brought on the attacks.

A similar situation exists with other drugs and antigenic treatments which are recommended for asthma. The simple application of procaine hydrochloride on the mucous membranes of the nose has

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produced severe attacks of asthma. Such substances as peptone, tuberculin, milk or typhoid and other bacterial vaccines may at times give relief, especially if they are administered in highly diluted doses; yet often they constitute a source of marked aggravation of asthma, sometimes even of death.

The use of morphine in asthma has been condemned by many experienced in the treatment of asthma, mainly for two reasons: 1. Morphine depresses the respiratory centre and the cough reflex, thus interfering with a vital protective process; namely, the expectoration of mucus plugs from the bronchi. 2. Patients are often sensitive to morphine. This is indicated by the relatively frequent occurrence of general pruritus and urticaria and the formation of a local weal following its administration. As will be shown later, relaxation of the patient in this condition is a therapeutic consideration of paramount importance. This drug, however, can well be replaced by less harmful ones.

2. *Elimination.*—In every case of severe asthma, elimination of all possible antigens should be attempted, regardless of whether or not sensitivity to such substances is evident. The stuffing of a mattress or a pillow is apt to cause a great deal of irritation in the upper air passages because of its close proximity to the asthmatic patient. Inhalation of such harmful substances should be prevented by covering the bedding with air-tight rubberized materials. Unquestionably the greatest assistance in eliminating harmful environmental factors is afforded through hospitalization. There is reason to believe that an asthmatic patient, particularly if symptoms have been present for some time, acquires many sensitizations arising from his immediate surroundings, such as house dust, certain types of upholstering in furniture and possibly certain fungi present in his home; in short, substances which cannot easily be eliminated. The patient's removal into a hospital induces, in most instances, a dramatic abatement of symptoms, especially if it is a fireproof and air-conditioned structure and, therefore, contains less dust and mould-producing substances.

One of the measures on admission to the hospital should be a thorough cleansing of the bowels by means of a large saline or dextrose enema. Its purpose is to eliminate digested and undigested food particles, absorption of which may have been instrumental in the production of the attack. Retention of water and of some of the dextrose and salt from these enemas may take place and assist the patient in his defence. Soaps should not be added, as untoward reactions, such as severe diarrhœa or increase of dyspnœa, may result if sensitization to soaps or some of the constituents (orris root) exists. For the same reason vegetable cathartics should be avoided.

The discontinuance of epinephrine is unquestionably one of the most important procedures. Most of these patients have been treated with this drug for some time. Epinephrine exhibits certain peculiarities that have not been sufficiently stressed in the literature. An asthmatic person very rarely requires more than from 0.3 to 0.5 c.c. subcutaneously of epinephrine in order to obtain its full therapeutic effect. Only in the most acute types of allergic reactions are larger doses necessary. After a patient has taken epinephrine for some time, his tolerance to this drug increases. By increasing the doses and shortening the intervals between injections, the patient soon reaches a stage at which even much larger amounts are of little or no benefit. In such instances discontinuance of the drug for a few days will re-establish the previous efficacy of the smaller doses. That such discontinuance can be carried out very abruptly without any marked difficulties whatever was demonstrated by observations on two patients who had taken as much as 1 ounce and 1¼ ounces (30 and 37.5 c.c.) respectively of epinephrine a day for many months. In both patients severe asthma of long duration promptly subsided on withdrawal of the drug and the subsequent management thus became much less difficult. Whether or not the drug itself has the tendency to keep up the asthmatic state it is difficult to say. The numerous small areas of infection of the skin which are often encountered as the result of improper sterilization of the hypodermic needles may aid in lowering the 'allergic balance'. If one recalls the clinical appearance of those in the habit of using epinephrine, their striking pallor, frailness, tremor and tachycardia, one cannot help but feel that the withdrawal of this drug constitutes a major therapeutic procedure in meeting the emergency of the asthmatic crisis. The same, to a lesser extent, may be said about ephedrine, because of its pharmacologic similarity to epinephrine; there is also the added chance that sensitization to ephedrine may be established by its too frequent use.

Among other eliminative procedures may be mentioned the puncture and irrigation of sinuses when considerable amounts of purulent secretion are present in the sinuses. In rare instances this may check the emergency state.

3. *Symptomatic treatment.*—Practically every asthmatic patient encounters an aggravation of symptoms on exertion. Insistence that the patient secures sufficient relaxation and sleep is of the utmost importance. This may be a most difficult task, because sensitization to the drug to be employed may be encountered. I found barbiturates advantageous for inducing rest. Some are inclined to administer from 5 to 7 ounces (150 to 210 c.c.) of ether dissolved in equal parts of oil by rectum. Others may follow, rectal instillation by either a syringe or a male catheter of tribromethanol in amylene hydrate. The dose recommended is 60 mg. per kilogram of body weight. While both measures are highly commendable, it should be borne in mind that sensitization to ether as well as death following the administration of tribromethanol in amylene hydrate has been encountered. Opinions may differ as to which is the most preferable means of sedation. Whatever one's choice may be, it is best to insist on employing only one hypnotic because of the increased risk of sensitivity when several hypnotics are used. Drugs that have been taken before without ill effect should be given preference. The first dose should be very small and its effect carefully watched.

If the hypnotic should not be sufficient to produce the desired degree of relaxation, the extreme exhaustion of the patient may require a narcotic. When this necessity arises pantopon (hydrochlorides of the alkaloids of opium, principally morphine) may be resorted to. The chief advantage of this drug over morphine is said to lie in its lesser action as a depressant on the respiratory centre, since some of the alkaloids which it contains are respiratory stimulants and thus counteract the paralysing effect of morphine. Clinically, one is impressed by the slight degree or absence of cyanosis when this drug is used.

Cough is a source of a great deal of discomfort. It is practically always followed by increased dyspnœa. Simple cough syrups containing ammonium chloride and potassium iodide may be of some assistance. Compound cough mixtures should be avoided because of the increased chance of sensitization to some of the drugs employed.

Cyanosis, which is often in evidence, may be combated by oxygen and carbon dioxide and, whenever available, by a mixture of 79 per cent helium and 21 per cent oxygen. The greater diffusibility of helium accounts for a more complete displacement of residual air than by other gases. In evaluating this treatment, however, one should bear in mind that, even in severe allergic asthma, cyanosis and anoxemia are not always present; that is, if no other complications such as heart disease or bronchiectasis exist and no narcotics have been given before. The dramatic results from the inhalation of helium gas may in some instances be explained by the displacement from the alveoli of air which is laden with harmful inhaled antigens and by its replacement with the dust-free gas. Therefore, its use is indicated even when no cyanosis is present.

In order to maintain the patient's nutritional state, intravenous injections of from 25 to 50 per cent solution of dextrose may be given. In addition to its

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caloric value, the osmotic effect of this hypertonic solution may aid in the removal of œdematous fluid from the affected lungs. Mainly for the latter purpose, the intravenous administration of 100 c.c. of 50 per cent sucrose to which 0.5 c.c. of 1 : 1,000 epinephrine solution has been admixed was suggested. Instant cessation of extreme attacks in six asthmatic patients has been observed. Some of the patients had previously failed to respond when intravenous injections of dextrose and epinephrine were given individually.

We have for several years used blood transfusions from either non-allergic persons or treated symptom-free asthmatic patients. The principal purpose of these transfusions is their nutritional value. We considered it possible also that a certain immune effect might be established which could be compared to that of transfusions in certain infectious diseases. This conception is made more plausible through the recent experiments showing the presence of protective or immune substances against specific antigens in allergic patients who had become symptom-free. Whether or not these substances also exist in normal individuals is not indicated. Our own experiments along these lines have not as yet been conclusive. Clinically, however, transfusions from both normal and symptom-free asthmatic patients were found very valuable. An intradermal skin test with the donor's blood and a preliminary small intravenous injection is first given in order to minimize the risk of untoward allergic reactions. (These might occur if the patient is sensitive to antigenic substances present in the blood of the donors.) Between 200 and 400 c.c. of blood is then given in the usual manner. The patient's exhausted and debilitated state nearly always responds. With the precautions outlined I have not had any allergic reaction in more than forty transfusions given in cases of this type and in other cases of allergy.

4. *Hyposensitization.*—Specific therapy has received very little attention in the literature on severe asthma. In my experience it is as indispensable in this emergency as in any other type of allergy. The method of rapid hyposensitization is based on the observation that a patient with hay fever may obtain instant relief during the hay fever season following one or several injections of specific extract, provided the dose is large enough to produce a moderately-sized local weal and not too large to cause generalized reaction. Guided by this principle of giving a sufficiently large amount and, at the same time, avoiding an overdose, this treatment can be made both effective and safe. The antigens chosen should be those which were found to be the main causative agents of this attack, on the basis either of skin tests or of clinical experience. During the summer months, the respective pollen in the air at the time of the attack should always be considered as a potential cause. A scratch test should first be performed in order to gauge the patient's tolerance. In case of a strongly positive skin reaction no injections should be given, since repeated scratch tests with this antigen may accomplish a desensitizing effect. If the test is negative or slightly positive, an initial dose of a highly diluted extract (as low as from 1 : 10,000 to 1 : 1,000,000) is administered, preferably intracutaneously, and its effect carefully watched. If the injection does not produce a weal, the dose can be worked up rapidly at intervals of one half to one hour until a local weal appears at the site of the injection. From now on, future injections should be cautiously gauged and the intervals between them lengthened until the effect of the previous injection has well subsided. This may require from two to twelve hours and more. If properly gauged, the asthmatic attacks begin to clear up simultaneously with the development of a weal, sometimes as dramatically as after an injection of epinephrine. If improvement does not ensue, other antigens should be chosen, because the one administered previously may not be one of the dominant agents in the production of this attack. During the course of the treatment one should constantly be watchful for an excessive local reaction at the site of injection and of an aggravation of the attack by the treatment. The injections should then be discontinued for several hours or for days until the flare-up is thoroughly controlled. When the injections are started again, considerably smaller doses should be employed. If carried out with these precautions, rapid hyposensitization treatment constitutes the method of choice in this emergency.

BRONCHOSCOPIC TREATMENT

In addition to these methods of treatment, another means of therapy should be available to all those treating a patient with severe asthma; namely, bronchoscopy. It should be held in readiness in case the other measures fail. This treatment is often too indiscriminately used in asthma, especially if advocated for the administration of iodized oil. In the asthmatic crisis, however, especially when the emergency is extreme, the introduction of a bronchoscope into the lungs should be regarded as a life-saving measure. Its purpose is to remove the thick, tenacious mucus, which is such a grave source of danger to the asthmatic patient, and to dilate spastic bronchi.

In a review of the records of 1,431 allergic asthmatic patients, it was found that there were seventy-six who had been hospitalized on one or more occasions because of unusually severe attacks. In only eight cases did bronchoscopic treatment have to be resorted to. Extremely severe and 'intractable' attacks promptly subsided on the removal of mucus from the bronchi in all but one case.

Among these seventy-six cases, death occurred in only one case.

It may be of statistical interest that only three others out of the 1,431 patients with allergic asthma died while under my care and that drugs seemed to be responsible in every single instance. One patient (J. H.) died during a moderately severe attack a few seconds after he had administered to himself 1 c.c. of epinephrine. There was blood at the site of injection and the typical blanching effect on the skin was not present, indicating that a vein may have been punctured and the drug thus had been injected intravenously. Another chronic asthmatic patient (J. T.) was said to have taken a 'patent medicine' containing coal-tar products for a headache at a time when he had been entirely free from asthma. Within a few minutes severe shock, dyspnœa, cyanosis and convulsions developed, followed immediately by death. The third patient died in some unexplained manner, after having taken a hypnotic during the course of a light attack of asthma. She appeared to be in a natural sleep, which gradually turned into a comatose state from which she could not be aroused. Death occurred two hours after she took the hypnotic. No wheezing had been noticeable before her death.

SUMMARY

1. The 'asthmatic crisis' represents either a sudden aggravation or the climax of a progressive state of asthma. It constitutes a grave emergency.

2. The following therapeutic principles are suggested:

(*a*) Extreme caution should be used in the introduction into the system of antigens that might aggravate the condition, particularly drugs.

(*b*) Such measures of elimination as are usually emphasized in the treatment of allergic disease should be carried out. Hospitalization is of great assistance in accomplishing this. In addition, withdrawal of epinephrine and similar drugs that have been given before is advisable.

(*c*) Symptomatic relief can be accomplished by measures which secure rest and relaxation, allay cough, control existing cyanosis and aid in the maintenance of the patient's nutritional state.

(*d*) Specific hyposensitization with antigenic extracts that are considered the chief source of the attack should be employed as the method of choice.

3. Among seventy-six cases thus treated, one death occurred and eight patients were not benefited until bronchoscopy was resorted to. In seven of the eight cases, the removal of thick tenacious mucus from the

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bronchial tree and an attempt at mechanical dilation of the bronchi resulted in prompt cessation of the emergency.

The Dangers of Bacteriophage Therapy

(From the *Journal of the American Medical Association,* Vol. CXI, 6th August, 1938, p. 536)

THE danger of producing bacteriophage-resistant variants with heightened virulence and tissue invasiveness would seem to contra-indicate local bacteriophage therapy in streptococcic infections. This conclusion by Dr. R. R. Madison of Stanford University School of Medicine is based on his study of the *in vitro* effects of bacteriophage on hæmolytic streptococci. As a test of this effect, 100 cubic centimetre flasks of veal-infusion broth plus 1 c.c. of bacteriophage (phage-lysed homologous streptococcus filtrate) were inoculated with 0.1 cubic centimetre of a twenty-four hour broth culture of *Streptococcus hæmolyticus.* The rates of population increase and fibrinolysin products were plotted for each flask; control flasks contained the same broth minus bacteriophage. During the first six hours the population of each flask increased to nearly 100 million streptococci per cubic centimetre. Lysis then occurred in the bacteriophage-containing flasks, the count falling to about 100 thousand per cubic centimetre as determined by the Petroff-Hauser counting chamber. (On gross appearance the flasks were then transparent, suggesting complete lysis.) This lytic fall in bacterial count was followed by a secondary overgrowth, the count increasing to nearly 10 million per cubic centimetre by the end of twenty-four hours. This bacteriophage-resistant overgrowth formed or secreted fibrinolysin at a faster rate than in the control flasks. By the end of twenty-four hours there was ten times the concentration of the fibrinolysin present in the bacteriophage medium that was present in the bacteriophage-free controls. In previous work Dr. Madison had shown that there is a close correlation between fibrinolysin production and the virulence or tissue invasiveness of hæmolytic streptococci. He concludes from his two studies that, although bacteriophage therapy might temporarily reduce the number of streptococci in a local lesion, such therapy would practically never completely sterilize these tissues and would invariably transform all residual streptococci into bacteriophage-resistant variants with presumably increased pathogenicity. This conclusion is in accord with the experimental evidence reported about two years ago by Bronfenbrenner and Sulkin in their study of local bacteriophage therapy in staphylococcic infections. Such local bacteriophage therapy invariably increased the size and severity of the staphylococcic lesion. The extravagant clinical hopes stimulated by the discovery of the Twort 'transmissible lysin' ('bacteriophage') seem at present of little more than historical interest. Nevertheless, commercialization of bacteriophage, unaccompanied by warning of possible clinical dangers, still continues in certain parts of the country.

Reviews

THE BRITISH ENCYCLOPÆDIA OF MEDICAL PRACTICE.—Under the General Editorship of Sir Humphry Rolleston, Bt., G.C.V.O., K.C.B., D.Sc., D.C.L., LL.D. 1938. Butterworth and Company, Limited, London. (To be completed in 11 volumes.) Sold in complete sets only. Cash price, Rs. 25 per volume. Also available on the instalment system at Rs. 10 per month. Price, Rs. 26-8 per volume. Only available from Messrs. Butterworth and Company (India), Limited, Calcutta. Volume V. Pp. xxiii plus 632 plus 51

THE first chapter in this volume is on 'Endoscopy' and the last on 'Goitre'. The forty-six chapters are on a varied assortment of subjects which the chances of nomenclature have brought into one volume, from enemas to epistaxis, from food to filariasis, and from gall-bladder disease to gas (poison) in war. The names of the writers are all well known and have most of them appeared in earlier volumes.

The chapter on filariasis is written by Dr. Manson-Bahr. This important subject is dealt with concisely and on the whole satisfactorily, though recent work in this country is entirely neglected and the information on '*Filaria' malayi* is not up to date, as a patchy but probably wide distribution has been recognized in India for some time. The writer was unable to resist the temptation of including an illustration of elephantiasis of the scrotum.

The chapter on food by Drs. McCance and Widdowson is excellent as far as it goes, but one feels that a little more space might have been allowed in view of the importance of this subject, and, for the sake of readers in the Empire outside Great Britain, some reference made to food requirements in other countries. The chapter appears particularly short in that it follows a long one on fœtus diseases and monstrosities, which covers fifty-four pages, in contrast to the twelve devoted to food. The chapter on the fœtus is an important contribution, but its interest is largely academic.

The chapter on enteric fevers is disappointing; it is a purely textbook account of the disease and seems to lack character. The most important point in the treatment, diet, is given the barest mention and a diet of only about 2,000 calories seems to be advocated. Even if the writer disapproves of the higher-calorie diet in this disease, he should say so; in view of the successes claimed by its advocates, it cannot be ignored.

An important subject included in this volume is etiquette and ethics in medical practice. The first paragraph should receive a wider publicity than it can ever hope to get here, as it will be read mainly by doctors, whereas it is the general public that would derive most benefit from it. The writer contradicts a common fallacy, namely, that there is a strict code of rules and regulations to which the doctor has to comply and which are framed to maintain the status and dignity of the profession regardless of the interests of the patient and the public.

Amongst the other contributions of importance there is a good account of glandular fever by Dr. Letheby Tidy, and a chapter on goitre and other diseases of the thyroid by Professor F. R. Fraser and Sir Thomas Dunhill, which is of the high standard that we would expect from these two eminent writers.

LECTURE NOTES ON LEPROSY.—By John Lowe, M.B., Ch.B. (Birmingham). 1938. Published by the British Empire Leprosy Relief Association, Indian Council, Talkotara Road, New Delhi. Pp. vii plus 56. Illustrated. Price, 8 annas

'THE following notes are not intended to be a full and complete description of leprosy, its diagnosis, treatment and prevention. For such a description larger publications should be consulted (*e.g., Leprosy, Diagnosis, Treatment and Prevention* by E. Muir). Such publications should be in the hands of all leprosy workers.

There is, however, a need for a publication on leprosy which is smaller, more concise and cheaper, and these notes aim at meeting this need.

These printed lecture notes are based on the cyclostyled lecture notes which the author has used for

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several years as the basis of the series of six lecture-demonstrations delivered each year as part of the course for the D.T.M. Calcutta and D.P.H. Calcutta.

It is hoped that these notes may be of use in two chief ways. First they should be of use to medical practitioners and medical students who are not, and do not intend to become, specialists in the subject, but who wish in a short time to get a grasp of the most important points regarding the diagnosis, treatment and prevention of leprosy. Secondly, they should be of use to those who have to teach others about leprosy, that is to teachers in medical colleges and schools, or to leprosy workers giving short courses of lectures on leprosy to general practitioners or to medical students. Such teachers might use these notes as the basis of their lectures and demonstrations, illustrating the various points by demonstrations of numerous patients, by lantern slides, microscopic specimens and so on'.

The above paragraphs are taken from the preface of this very valuable little book. We are quite satisfied that this book will meet the needs, and be useful in the ways, that the author hopes. The author is an experienced teacher and has presented his subject clearly and concisely. The illustrations are numerous; they are excellently reproduced photographs which show exactly what they are intended to show, even the photomicrographs. The printing and paper are good, and altogether the brochure is extraordinarily good value for its exceptionally low price.

THE PRINCIPLES AND PRACTICE OF MEDICINE. DESIGNED FOR THE USE OF PRACTITIONERS AND STUDENTS OF MEDICINE.—By the late Sir William Osler, Bart., M.D., F.R.C.P., F.R.S. Revised by H. A. Christian, M.D., LL.D., S.D., F.R.C.P. Thirteenth Edition. 1938. D. Appleton-Century Company, Incorporated, London, and New York. Pp. xxv plus 1424. Price, 35s.

No one can fail to admire the courage of an editor of a textbook of medicine who concludes his preface with the words 'In preparing this revision, wisely or unwisely, I have had the assistance or criticism of no one', but whether this admiration will be extended to other features in his character does not seem so certain.

As one cannot hit a man who puts his hands behind his back, we must content ourselves with remarks on the general arrangement, which has not been changed to any great extent and is a rational one, and on the format, which is excellent. Nearly three hundred pages have been added in this edition but the book does not seem to be uncomfortably bulky or heavy, and the type is particularly easy to read. Almost two generations of students and physicians have confidently relied upon their 'Osler' as a textbook of the first order, and we see no reason why another generation should not do so.

A SHORT PRACTICE OF SURGERY.—By Hamilton Bailey, F.R.C.S. (Eng.), and R. J. McNeill Love, M.S. (Lond.), F.R.C.S. (Eng.). Fourth Edition. 1938. H. K. Lewis and Company, Limited, London. Pp. viii plus 996, with 818 illustrations of which 109 are coloured. Price, 28s.

THE first edition of this book in 1932 was accorded an enthusiastic reception. The progress of the subsequent editions has been no less remarkable. The call for four editions and two reprints in the brief space of six years bears eloquent testimony to this fact. Surgery progresses with such rapid strides that it is difficult for a textbook to maintain the pace. The whole of the text of the present edition has been reset, but it rebounds to the credit of the authors that in spite of thorough revision and the inclusion of 55 additional figures the bulk of the book has not been increased. A new feature of this edition which deserves special mention is the inclusion of brief historical data in the form of foot-notes.

Ever since the first appearance of this book we have recommended it to each succeeding batch of medical students as the best textbook of surgery. We have nothing more to add to this encomium. The names of the joint authors have come to be identified with an excellence of illustration and a lucidity of description which are almost unrivalled. Thus it appears that the ancient Chinese proverb 'one picture is worth a million words' is no exaggeration.

The printing, get-up and illustrations are all first rate and are in keeping with the reputation of the publishers.

P. N. R.

DISEASES OF THE EYE.—By Sir John H. Parsons, C.B.E., D.Sc., F.R.C.S., F.R.S. Ninth Edition. 1938. J. and A. Churchill, Limited, London. Pp. viii plus 705, with 21 plates and 360 text-figures. Price, 18s.

THIS is the ninth edition of this world-famous textbook of ophthalmology and the appearance of a new edition after a lapse of only two years is sufficient proof of its popularity.

The book is divided into eight sections which consist of the anatomy and physiology, the examination of the eye, diseases of the eye, errors of refraction and anomalies of accommodation, disorders of motility of the eye, symptomatic diseases of the eye, diseases of the adnexa of the eye, preventive ophthalmology and finally three appendices on the preliminary investigation of the patient, therapeutic notes, and the requirements of candidates for admission into the public services.

The book is well illustrated with 21 plates and 360 text-figures. It is still kept within reasonable proportions and differs very slightly from the previous edition. The author has added some new drugs and new methods of treatment.

We know of no textbook which can be so strongly recommended for students and medical men who are interested in the study of ophthalmology.

E. O'G. K.

OPHTHALMIC NURSING.—By D. E. Grand. 1938. E. and S. Livingstone, Edinburgh. Pp. ix plus 111. Illustrated. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 3-12

THE object of this manual is to deal with the main points in ophthalmic nursing and to provide a brief summary of the signs and symptoms of the common eye diseases which most frequently occur.

The first portion deals with the anatomy and physiology of the eye, the common types of refractive errors and general ophthalmic nursing. The author lays special stress on the fact that the eye is a part and parcel of the body and thereby, in the treatment of the eye condition, the body should be looked after carefully. Attention has also been drawn towards the peculiarities in temperament of ophthalmic patients; their individual likes and dislikes are to be studied to a greater degree than those of surgical or medical patients.

Section II comprises a brief survey of the common eye conditions and their treatment. The various methods of nursing in different eye diseases have been described in detail. It is a pity that nothing has been mentioned about general anæsthesia which is sometimes required in ophthalmic practice.

In section III the common eye operations are described briefly and a list of instruments required in each operation is given. The instruments are all illustrated in an excellent way.

An extract from the foreword by Mr. A. C. Hudson is well worthy of publication:—

'There is perhaps no branch of nursing in which the responsibility of the nurse is greater than the supervision and treatment of diseases of the eye, and a realization of the disastrous consequences liable to ensue from lack of meticulous care in all manipulations, and in supervision in the ward and operating theatre, cannot be too strongly inculcated in those engaged in such duties.'

The book, which is the outcome of an extensive experience in ophthalmic nursing, will doubtless prove

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to be very useful for nurses and those interested in ophthalmic nursing in India.

E. O'G. K.

A HANDBOOK OF TROPICAL DISEASES WITH TREATMENT AND PRESCRIPTIONS.—By P. B. Bhattacharya. Second Edition by J. C. Banerjea and P. B. Bhattacharya. 1938. Published by U. N. Dhur and Company, 15, College Square, Calcutta. Pp. x plus 413. Illustrated. Price, Rs. 7-8

THE reviewer did not know the first edition of this book, a fact that he regrets, as, judged from this edition, it is a book that has been compiled with a considerable amount of care and with frequent reference to the best authorities.

Most of the important diseases and infections that occur in India and that are usually classified as tropical diseases are included; notable exceptions are yaws, dracontiasis, Weil's disease and pellagra. They are arranged in groups, diseases caused by protozoa, by bacteria, by filterable viruses, by helminths, by spirochætes, and by venomous animals, diseases due to vitamin deficiency and to physical agents, and diseases of unknown origin.

Each disease is described thoroughly from the point of view of the physician, under the headings ætiology, pathology, clinical manifestations, clinical and laboratory diagnosis, differential diagnosis, treatment, and prevention. In nearly every section facts are summarized in phrases or sentences which are numbered; this will appeal to the student, particularly when he is revising a subject with which he is already familiar.

Naturally, one has a few criticisms; the first is that the book bears the stamp of the pedagogue rather than that of the physician. It is a good thing to have one's facts nicely summarized and classified, but the classification habit can be carried too far and false differentiations manufactured. For example, in the section on post-kala-azar dermal leishmaniasis, under the heading 'Predisposing causes' the following classification is given:—

'1. Residence in areas where kala-azar is endemic.
2. History of kala-azar about 1 to 3 years previously
(*a*) with antimony treatment resulting in
(*i*) complete cure or
(*ii*) incomplete cure associated with presence of flagellates in a culture of peripheral blood.
(*b*) without antimony treatment.'

The facts are that this condition is a sequel to generalized leishmania infection and that it appears 1 to 3 years after the visceral infection has been cured, either spontaneously or after treatment.

Another criticism is that the title is misleading; only tropical diseases that occur in India are included. Further, the charge cannot be limited to nationalism, as the book has a distinct air of provincialism; for example, under the heading of 'Differential diagnosis' a phrase such as 'does not occur in Bengal' or 'rare in Bengal' appears more than once.

Finally, the index is no index but a sort of rearranged contents list.

However, we consider it a book that the undergraduate medical student will find very valuable as a supplement to his ordinary textbooks of medicine, in which the subject of tropical diseases is so often badly neglected. The post-graduate student studying for the licence or the diploma of tropical medicine will also find it useful.

We cannot close this review without a word of praise for the publishers. They have done their work excellently and produced a book that compares well with medical books published in Great Britain and the United States. The paper is good, the print clear, and the binding satisfactory, and above all there are few type-setting errors.

L. E. N.

PHYSIOLOGICAL AND CLINICAL CHEMISTRY.—By William A. Pearson, Ph.C., M.D., Ph.D., Phar.D., Sc.D., LL.D., and Joseph S. Hepburn, A.M., B.S. in Chem., M.S., M.D., Ph.D. Second Edition. 1938. Henry Kimpton, London. Pp. 467. Illustrated with 46 engravings. Price, 25s.

THIS book has been written with a view to imparting a broad general knowledge of biological chemistry to the student of medicine as is essential for a thorough understanding of such subjects as physiology, bacteriology, immunology and other allied subjects.

For the convenience of the student the book has been divided into three main parts. The first portion of the book begins with pure physiological chemistry and includes chapters dealing with the physico-chemical principles (such as the composition of matter, molecular weight, hydrogen-ion concentration, etc.), and various methods of quantitative analysis (such as gravimetric, volumetric, colorimetric, electrometric, gasometric, etc.). Thereafter the author proceeds to give a brief survey of organic chemistry and includes fairly comprehensive chapters on lipins, carbohydrates, proteins, enzymes, and the composition of tissues, which will help to give an average student more than superficial knowledge in these subjects.

The second portion of the book deals with the important subject of food and metabolism and within a limit of 56 pages the author has very ably dealt with such subjects as the chemical composition and the specific dynamic action of food, basal metabolism, vitamins, digestion and absorption of the different foodstuffs and food poisoning. Chapter IX which deals with this important subject is an interesting study and will repay perusal.

The last part of the book deals with clinical chemistry. This portion, which covers more than one-third of the whole book, deals with such important subjects as salivary, gastric and intestinal digestion, chemical and microscopical examination of fæces, composition of blood, lymph and cerebrospinal fluid, biochemical analysis of blood—clinical and medico-legal tests for blood, chemical examination of urine, qualitative and quantitative, kidney function test, etc.

The last part of this section deals with the composition and analysis of milk and water.

The laboratory work described at the end of each chapter appears to us to be of value and students are advised to carry out the experiments to make themselves thoroughly acquainted with the subject-matter described in the chapter.

This book is well written and the perusal of the book would be of help to the student in getting a clear insight into the subject of physiological and clinical chemistry.

J. P. B.

BIOCHEMISTRY FOR MEDICAL STUDENTS.—By W. V. Thorpe, M.A. (Cantab.), Ph.D. (Lond.). 1938. J. and A. Churchill, Limited, London. Pp. viii plus 457, with 37 illustrations. Price, 12s. 6d.

THE word 'biochemistry' has only come into general use during the last twenty years, and according to the *Oxford English Dictionary* only came into the English language at the beginning of this century, though the word 'biochemical' appeared some thirty years earlier. It can be defined as the 'study of the chemical and physio-chemical reactions of the human and animal body'; it is in fact a link between chemistry, particularly organic chemistry, and physiology.

A number of books on biochemical methods in medical practice have been published; these are suited to the needs of the physician and surgeon, but this book is meant for the student, and it may be looked upon as a book on physiology which has specialized in the physio-chemical aspects of the subject that have an important application in medical diagnosis and treatment, without going as far as actually applying them.

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It is a book that should be used by the student of physiology in conjunction with his textbook on the subject and not instead of it. Much more emphasis is laid on chemical processes than is usual in textbooks on physiology and many formulæ are given. These may alarm the medical or dental student whose chemical sense is not highly developed. He will however find them helpful in demonstrating the chemical affinities between different substances and he will seldom find it necessary to memorize them.

As one would expect, the chemistry of food and the principles of nutrition are given an important place in the book. The chapters on these subjects are concise and comprehensive: they will be useful to the student and teacher as an introduction to lectures on nutrition.

We have few criticisms, and these are mostly matters of individual opinion; for example, we should like to have seen a chart showing the normal acid secretion of the stomach.

It is a book that should serve its purpose well and we strongly recommend it to teachers in this country, as well as to physicians and students for higher degrees.

LABORATORY MANUAL OF HEMATOLOGIC TECHNIC—INCLUDING INTERPRETATIONS.—By R. C. Beck, M.A., M.D. 1938. W. B. Saunders Company, Philadelphia and London. Pp. 389. Illustrated. Price, 18s.

THE laboratory attendant—the laboratory technician of America and the 'lab. boy' (who must in many instances be a grandfather by now) of the British medical laboratories—is coming into his own and his true value and importance are being recognized. Perhaps the singular pronoun should have been avoided as it is nowadays so often, and very suitably, 'she'.

Perhaps one of the most important developments in medical science to lead indirectly to this recognition has been the advance in hæmatology and the development of hæmatological technique. Much of this is very laborious and very time absorbing, and, though labour can be reduced considerably by using suitable laboratory apparatus, the amount of work that one pair of hands, and eyes, can perform in the day is limited. Again, though in blood work great care, accuracy, and patience is required in the case of many examinations, after the technique is standardized and the necessary manual dexterity acquired it becomes mechanical and does not need any deep understanding of the subject. Further, the highly trained pathologist or research worker will naturally feel that he is wasting his time, is liable to become impatient, and is therefore temperamentally not so well suited to the work as the trained 'technician'.

This book has been written for laboratory technicians and is admirably suited to their requirements, but it is a book that every laboratory worker, however highly qualified and however experienced, will find useful. There is an immense amount of detailed information on the subject which the book claims to cover, and there are few methods that have received any sort of recognition that are not included.

The book is a little more than a record of technique; the reason for the examination and the significance of the result, as well as the rationale of the method advocated, is usually given. There are innumerable illustrations and diagrams, and some very useful conversion tables, *e.g.*, grammes to percentages of hæmoglobin. The source of the diagrams is seldom acknowledged, though many of them, if not true copies, are very free adoptions from the papers of other workers.

It is very surprising that no books on technique give the degree of error that may be expected with each particular method; one so often sees clinicians, confidently quoting results that are so obviously 'cooked', or referring to small differences as matters of great significance, when the two readings are well within the normal range of technical error.

This is a book that we can strongly recommend as a guide to hæmatological technique for the use of any laboratory worker.

MODERN ANÆSTHETIC PRACTICE.—Edited by Sir H. Rolleston, Bt., G.C.V.O., K.C.B., M.D., F.R.C.P., and A. A. Moncrieff, M.D., F.R.C.P. 1938. Published on behalf of the 'Practitioner' by Eyre and Spottiswoode (Publishers), Limited, 6, Great New Street, E.C.4, London. Pp. 213. Price, 10s. 6d.

THIS, the third book of this important series of practical handbooks edited by Sir Humphry Rolleston, is a symposium of articles on modern anæsthetic practice that have appeared recently in our invaluable contemporary *The Practitioner*.

Advances in anæsthesia have been in two directions, one mechanical and the other chemical, each equally important in its own different way. Invaluable as they are, chloroform and ether are poisons, and both these modern trends are leading to the relegation of these two drugs to the medical history books of the future, so to speak. The mechanical advances are not an unmixed blessing. They have enabled operations to be performed with safety that could not have been undertaken before, or, if so, only with the greatest risk to the patient, so that the surgeon naturally demands the best anæsthetic available, even for his less difficult cases. The result of this is that the student does not get the same practical experience, as did his counterpart of 25 years ago, in the methods of anæsthesia on which he will in nine cases out of ten have to depend in the future. This is particularly true in India; one cannot deny the right of the surgeon and anæsthetist to take advantage of recent advances in the large hospitals and teaching institutions, but in this vast and comparatively poor country the 'nine cases out of ten' becomes ninety-nine out of a hundred.

On the other hand, the 'chemical' advances have been of considerable importance in this country, and the introduction of the avertin and the barbiturate groups of drugs has been of the very greatest assistance to the isolated medical officer, and to the obstetrician.

Each chapter in this book deals with a different aspect of the subject; some of the titles are, nitrous oxide anæsthesia in surgery, basal anæsthesia, endotracheal anæsthesia, anæsthesia and analgesia in midwifery, spinal anæsthesia, local anæsthesia and analgesia, and anæsthesia in dentistry.

One writer uses the word *wheal* when he means *weal*. Isn't it time that some authoritative medical writer took a firm line on the spelling of this word, and who is in a better position to do this than the editor of this series? The word *wheal* is an English word of long standing meaning a pimple or pustule; the alternate spellings given in the *O. E. D.* include *wheel, wheell* and *whelle;* but it is a word that has recently fallen into disuse. *Weal* is a variant of *wale;* it is a word of equally long standing and means 'the mark or ridge raised on the flesh by the blow of a rod'. To take the present instance, an intradermal injection obviously produces something much more like a *weal* than a *wheal,* but the writer spells it *wheal*. The English language is not static; new words come into use, others drop out, and the meaning of words is continually changing. About fifty per cent of English writers use the spelling *weal* and the other fifty per cent write *wheal;* but uniformity is desirable, so why should not the correct spelling be adopted by all English writers.

To return to the book under review, space will not now allow us to say more than that it is an ideal book for the practitioner who wishes to extend his knowledge of modern anæsthetic methods.

A B C OF THE VITAMINS: A SURVEY IN CHARTS.—By J. Gregory, M.S. 1938. Baillière, Tindall and Cox, London. Pp. xii plus 93, with 56 charts. Price, 13s. 6d.

THE idea of publishing an A B C for the use of the student and physician is a good one, but as a means of conveying knowledge the diagrammatic method has its limitations; precision has too often to be sacrificed. For obtaining superficial knowledge in the shortest possible time no method could be better; on this framework a sounder knowledge can easily be built. There

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is however a danger that the indolent student and the slovenly practitioner will be satisfied with this very superficial knowledge and not go further into the subject. In this particular instance there is perhaps an added justification for the employment of the method, as, except in the case of a few vitamin deficiencies, all that the student and practitioner needs is an outline of the subject.

Whilst there are a number of very useful diagrams which give one an immediate visual picture of the disease, *e.g.*, pellagra and rickets, there are others in which the facts do not really lend themselves to this method of demonstration; for example, the experiment in vitamin-E deficiency and sterility is explained in nine short sentences, each put into a separate compartment and spread out over two large pages (and incidentally arranged in such a way that the reviewer at first read them in the wrong order) which are decorated with a few line drawings of rats; this could have been told as a consecutive story in less than half a column of this journal, with almost greater clarity.

On the credit side again there are the maps showing the world distribution of certain diseases; the one on rickets is particularly good, though osteomalacia is shown as very common in the whole of tropical India, whereas really its highest incidence is in certain parts of northern sub-tropical India.

It is a book that we can strongly recommend to teachers in medical colleges and schools in India, as well as to sanitarians, practitioners and health workers.

THE HISTORY OF BACTERIOLOGY.—By W. Bulloch, M.D., F.R.S. 1938. Oxford University Press, London, and New York. Pp. xii plus 422. Illustrated. Price, 10s. 6d. Obtainable from Oxford University Press, Bombay and Calcutta

THE history of bacteriology is in a way the history of modern medicine. In the days of ancient Greek medicine, the suspicion obviously lurked in the minds of such writers as Hippocrates and Herodotus that there was something in the disease-causing 'miasmas' which the human eye could not see, though, if they thought more deeply than that, they probably endowed it with a chemical rather than an animate nature. It was not until the medical renaissance of the 16th century that this suspicion took a more concrete form—for example, in the writings of Fracastorius—to become a theoretical proposition in the 17th and 18th, with the evolution of the microscope, and a proven fact in the 19th century.

It is impossible to give the date of the birth of bacteriology or to fix its paternity. History is not a simple matter of names and dates, and, though there must be few more fascinating pastimes than historical research, the boundary line between the results achieved and just honest fiction is extremely narrow. It is seldom possible to apportion the credit for any discovery or any idea—the brilliant but indolent theorist, the perspicacious opportunist, and the dull but industrious worker each play their part and it is a matter of chance whose name is remembered.

Athanasius Kircher (1602–1680) seems to have been a theorist, though not an indolent one, who wrote on many subjects, including the microbic origin of contagious disease, in words that would entitle him to claim priority if he were alive to-day. However, historians do not approve of him; they consider that none of his works constitute a scientific advance, and Dobell, three hundred years later, feels justified in referring to him as 'a man possessed of neither scientific acumen nor medical instinct', strong words to use about a fellow medical writer on so distant an acquaintance. We hope that future historians will be kinder, and if they remember Clifford Dobell, F.R.S., at all they will remember him as more than van Leeuwenhoek's biographer.

A sense of humour, or a sense of proportion which is much the same thing, is essential in a historian and this Professor Bulloch certainly possesses; added to this is his personal acquaintance of many of the great bacteriologists of the last half century—perhaps the most important period in the evolution of bacteriological science—a combination that makes his work the most readable and most important contribution to the subject at present available.

The extensive bibliography and the short biographical notes on some three hundred bacteriologists complete it as a valuable book of reference.

A TEXTBOOK OF BACTERIOLOGY FOR DENTAL STUDENTS.—By Arthur Bulleid, L.R.C.P. (Lond.), M.R.C.S., L.D.S. (Eng.). Second Edition. 1938. William Heinemann (Medical Books), Limited, London. Pp. xvii plus 207, with 60 illustrations. Price, 15s.

THIS is the second edition of a useful little book which is essentially a practical book with the necessary amount of theoretical matter. The book is designed to meet the needs of dental students and practitioners, and deals in a practical way with the laboratory investigations that can be carried out in diseases of the mouth. There is much in this book that will be of interest to bacteriologists in general.

MUIR'S BACTERIOLOGICAL ATLAS.—By C. E. Van Rooyen, M.D. (Edin.). Second Edition. 1937. E. and S. Livingstone, Edinburgh. Pp. xvi plus 90. Price, 15s. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 10

FOR ten years Muir's Bacteriological Atlas has been used by many students of bacteriology and has been of great help to the teachers of bacteriology in conveying to students the outstanding morphological features of pathogenic micro-organisms which neither a description nor a photograph can convey as forcibly as a well-drawn diagram. The slight exaggeration, in proportion to their surroundings, of important diagnostic features which is possible in diagrams is of value in the recognition of their presence. In this second edition the text has been thoroughly revised and twenty-six new coloured plates have been added. When used in conjunction with a textbook of bacteriology the student will find this atlas of immense value in studying microscopic preparations of different micro-organisms.

C. L. P.

ELEMENTARY ANATOMY AND PHYSIOLOGY.—By J. Whillis, M.D., M.S., F.R.C.S. 1938. J. and A. Churchill, Limited, London. Pp. ix plus 342, with 87 illustrations. Price, 12s. 6d.

THERE is such a very close connection between anatomy and physiology that it is a matter of regret that, although the subjects are taught simultaneously in the medical course, there is not more liaison between them. A combined textbook dealing with the two subjects fully is of course out of the question, but the idea of writing a book introducing anatomy and physiology side by side is a good one.

In the volume under review the author has carried out this idea very satisfactorily and has produced a book which the student commencing his medical course could read with considerable advantage, as it simplifies and clarifies the two subjects, and at the same time shows where lie the connecting links which are not always obvious in the standard textbooks.

It is a book that is particularly suited to the student studying in the smaller medical schools in India and proposing to take one of the lower qualifying degrees, and we recommend this book to teachers in such schools, as a class textbook to form a grounding on which they can build. It should also be useful to nurses and others who are not required to go very deeply into the subject.

The publishers have done their work excellently, the type is easy to read and the illustrations are numerous and clear.

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Abstracts from Reports

PROCEEDINGS OF THE INTERNATIONAL UNION AGAINST TUBERCULOSIS, LISBON, SEPTEMBER 1937. By E. BRIEGER. AFTER-CARE AND REHABILITATION, PRINCIPLES AND PRACTICE. (ALSO PUBLISHED AS A SPECIAL SUPPLEMENT TO THE OCTOBER 1937 NUMBER OF THE *BRITISH JOURNAL OF TUBERCULOSIS*)

THIS remarkable memorandum prepared by Dr. Brieger and edited by Sir Pendril Varrier-Jones, Dr. E. Bachmann and Dr. W. Bronkhorst with the co-operation of various European organizations, was presented to the 1937 session of the International Union against Tuberculosis. It presents evidence of much laborious investigation and statistical analysis and may be considered as the *vade mecum* on the subject. All the available evidence has been critically sifted and unbiased conclusions arrived at. The compiler and the editors must be congratulated on the publication of such a timely monograph on a subject which is now occupying the attention of workers in all parts of the world. It will repay perusal by all tuberculosis workers, state and local authorities and anti-tuberculosis organizations, particularly in India where an all-India anti-tuberculosis association is to be inaugurated in the near future (*vide* Correspondence, page 774 this journal).

The monograph is divided into three parts, with sub-sections, appendices and graphs. Part I deals with prognosis and after-care, part II with social rehabilitation and part III with the multiple unit for institutional care and after-care. The material utilized for the investigation has been drawn from European and American institutions.

In the initial stages of anti-tuberculosis work in these countries, treatment in sanatoria was considered to be the chief factor in the relief of the problem, but experience soon showed that although treatment was an extremely important factor it was not in itself sufficient. The establishment and growth of dispensaries, with their many-sided activities, followed as a matter of course. 'But in spite of this and of constant improvement in therapeutic methods, the ultimate results, except for what may be called the minimal cases, remained unsatisfactory'.

The immediate results of combined intensive treatment in sanatoria, as demonstrated by Christensen, show that under routine sanatorium treatment 30 per cent of tubercle-positive cases on admission become tubercle-negative, when this is combined with pneumothorax treatment the figure rises to 50 per cent and with the triple combination of sanatorium treatment, pneumothorax and gold therapy the figure reaches 65 per cent. But the ultimate success of the treatment has been found to depend largely upon environment and *after-care*. The after-care material may be divided into four categories, *viz*, (1) those who, after treatment of varying length, are completely healed, (2) those who regain their full earning capacity through temporary after-care; (3) those who retain it through permanent after-care and (4) those who cannot regain their earning capacity because their illness takes an unfavourable and unstable course. The relapses in the improved cases may be due to premature resumption of work, to unsuitable work or to an inadequate standard of living. Early detection, sufficiently long sanatorium treatment, the guarantee of adequate economic conditions and regular hours of work have been shown to have a definite influence upon the prognosis in tuberculosis.

After-care is an essential part of sanatorium and hospital organization. It enters into direct relation with therapy and furnishes the auxiliary organization which alone can ensure the final success of treatment. It has been pointed out, and we agree with the view, that therapy with temporary after-care will perceptibly raise the number of effective cases. The sociological function of ensuring a livelihood to the permanently disabled cases, which fail to respond to treatment and after-care, is not yet a duty imposed on sanatoria in the West. In the Papworth scheme the provision of an industrial settlement, ensuring a livelihood for semi-healed and permanently disabled cases, is combined with efficient therapeutic treatment. The problem of the livelihood of the chronic tuberculous needs a stable solution. After-care work should be directed towards (1) the provision of work carefully selected to maintain the physical improvement achieved by sanatorium treatment, (2) the maintenance of the recovered health, under suitable working conditions and environment, of those who have regained full working capacity and (3) the provision of an environment suited to their sub-standard life of those whose working capacity is permanently reduced, either in the open labour market or as settlers in a work-colony. The restoration of working capacity for the tuberculous is undoubtedly the ultimate object of all measures for care and treatment. 'The tuberculous working man who survives from year to year must work in order to exist, although it is known that certain stress and strain may seriously impair the benefits of treatment. The tuberculous members of the population must be regarded as a real factor in the economic system of the nation'.

Broadly speaking, there are two aspects of rehabilitation: (1) removing the physical disability if possible (physical rehabilitation) and (2) making the disabled person a functionating economic unit (vocational rehabilitation). It is estimated that 50 per cent of patients discharged from sanatoria find their way back to some occupation. Therefore their rehabilitation and incorporation in the industrial economy of the nation constitutes a special problem, inasmuch as it demands the application of clinical, physiological and psychological tests for estimating the working capacity of the sub-standard worker in relation to individual physical condition and actual working conditions, followed by continuous medical care throughout the life of the individual. The period of rehabilitation should begin as 'industrial convalescence' and is followed by re-employment, under conditions where the benefits of therapy are consolidated rather than tested by strain. We agree with Dr. Brieger when he states that 'the re-employment of the tuberculous depends upon the degree of stabilization in general physical condition that can be attained by treatment. The recovered case may be able to achieve a degree of stabilization which will allow return to work in normal life. The invalid, however, must be cared for, either in hospitals or homes where the risk of infection is minimized. Those most in need of sheltered conditions of employment are those who constitute the group known as 'middle cases'. From their condition they are unemployable in normal industry. For such persons industrial settlements have developed as a combination of treatment and employment'. Sheltered industries are most satisfactory for the re-employment of the tuberculous where an industrial plant is set up under hygienic conditions and fully mechanized.

Dr. Brieger thinks that it is possible to build up a scheme like the above at no greater cost than relief by public assistance and that the cost to the community becomes considerably less in infection as well as in money.

The care of the tuberculous is inevitably a heavy charge but the highest measure of success is likely to be attained when the three fundamental aspects of the work—care (dispensary including prophylaxis), treatment (hospitals and sanatoria) and after-care—are so organized that harmonious co-operation between them is assured. At the present moment, this is far from being achieved. It is hoped that this timely publication will help to stimulate measures in this direction. The writer and the editors are to be congratulated in focusing attention on the movement of after-care and rehabilitation.

A. C. U.

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THE ROCKEFELLER FOUNDATION, NEW YORK: ANNUAL REPORT FOR 1937

Trusting the future

ON 23rd May, 1937, John Davison Rockefeller, the founder of The Rockefeller Foundation, died in his ninety-eighth year. Mr. Rockefeller's gifts for philanthropic purposes were roughly $530,000,000. He gave a total of $446,000,000 to establish four funds: The Rockefeller Institute for Medical Research, the General Education Board, The Rockefeller Foundation, and The Laura Spelman Rockefeller Memorial. In addition, Mr. Rockefeller made individual contributions of approximately $84,000,000 for educational, religious, and charitable purposes. Since their foundation, the four funds established by Mr. Rockefeller have expended a total of $645,000,000 in 88 different countries.

Mr. Rockefeller always made his gifts after thorough study and careful planning.

In the first place, he trusted the future. He did not think that benevolence and wisdom were confined to his generation. He was not under the illusion that what seems important to-day will necessarily be important to-morrow. He did not believe in tying up foundations to rigid and unchangeable purposes. When The Rockefeller Foundation was incorporated, the sole purpose stated in his charter was 'to promote the well-being of mankind throughout the world'. It was characteristic of Mr. Rockefeller's developing point of view that in 1920 he wrote to the trustees of the General Education Board as follows:—

If in any gifts heretofore made to you by me there are any restrictions or limitations as to the specific purpose for which they are to be used, I hereby revoke such restrictions.

In the second place, Mr. Rockefeller did not believe that it was wise to attempt to maintain foundations in perpetuity. 'Perpetuity is a pretty long time', he remarked. It is perhaps not generally known that under their characters both The Rockefeller Foundation and the General Education Board are authorized to expend principal as well as income. In addition to income, the Foundation has thus far spent $87,000,000 from its principal fund, while the General Education Board has spent $140,000,000. Two Rockefeller boards have already terminated their activities: The Laura Spelman Rockefeller Memorial, founded by Mr. Rockefeller, was merged with the Foundation in 1929 after having spent $27,500,000 of its principal fund; the International Education Board, established by Mr. Rockefeller, Junior, was completely liquidated in 1937. The General Education Board is now approaching liquidation. How long The Rockefeller Foundation may continue depends upon the opportunities for expenditure which lie ahead.

These ideas of Mr. Rockefeller have had great influence in shaping the policies of the boards which he established. The temptation to visualize the future in terms of the present—to think of the needs and methods of to-day as having a sure claim to immortality—is one which confronts trustees as well as founders of philanthropic foundations. For example, to establish under a permanent endowment in some university or research centre a department or chair of psychiatry or organic chemistry may seem, with such light as we have at the moment, a rational and socially desirable step. But what wisdom have we to-day to determine that a century or more hence psychiatry and organic chemistry will represent the pressing needs or the practicable techniques of that time? In endowing what they thought was of permanent importance, earlier generations made wrong guesses which embarrass us to-day. How can we assume that our guesses have any greater validity or are made with any clearer foresight?

This question led the trustees of The Rockefeller Foundation and of the General Education Board to adopt a principle by which recipients of gifts to endowment funds, for whatever purpose given, have wide discretion in the uses to which those funds may be put. Specifically, under a resolution passed by both boards in 1937, notification is sent to each recipient that it is the desire of the boards that the gift, 'whether the income only is spent or the principal as well, shall always be regarded as available for use in the broadcast way, so as best to promote the general purpose for which it was made'. The notification contains the provisions outlined in general terms in the three succeeding paragraphs—

(1) Ten years after the date of the gift, the income from it may be used in whole or in part for some purpose other than that for which the gift was made, such purpose to be as reasonably related to the original purpose, as may be found practicable at the time, having regard to intervening changing conditions.

(2) Beginning five years after the date of the gift, 5 per cent of the principal of the fund may be used each year for any purpose for which income may then be used.

(3) After the expiration of twenty-five years, any part or the whole of the principal may be used for some other purpose, the new purpose—as in point 1—to be as reasonably related to the original purpose as may be found practicable at the time, having regard to intervening changing conditions.

These liberalizing provisions represent an attempt to free the future from frozen funds and 'tired' endowments, in the belief that the wisdom of this generation cannot be substituted for the wisdom of the next in the solution of problems hidden from our eyes. The endowments affected by these provisions amount to $51,000,000 given to date by The Rockefeller Foundation, and $148,000,000 given by the General Education Board.

The year in brief

During 1937 The Rockefeller Foundation appropriated a total sum in excess of $9,500,000. Of this amount, $2,400,000 was given to the medical sciences, $2,200,000 to public health, $2,000,000 to the social sciences, $1,100,000 to the natural sciences, $800,000 to the humanities, and $400,000 to rural reconstruction in China.

In carrying out its 1937 programme the Foundation operated in 52 different countries, from Norway to the Fiji Islands. Twenty-three of these countries were in Europe, four in Asia, three in Africa, six in South America, eleven in North and Central America and the West Indies, and five in other parts of the world. Forty-five per cent of the money given went to foreign countries, and the remainder, 55 per cent, was for work in the United States.

New international barriers

From the beginning of its activities twenty-five years ago the Foundation has been guided by the objective written into its charter: 'The well-being of mankind *throughout the world*'. In accordance with this purpose the aim of the trustees has been to maintain the work of the Foundation on an international plane without consideration of flags or political doctrines or creeds or sects. Particularly in a programme based on the advancement of knowledge it is imperative to disregard the geographical boundaries which arbitrarily and often unhappily divide the earth into a patchwork of senseless antagonisms. For in the last analysis knowledge cannot be nationalized. No successful embargoes can be maintained against the export or import of ideas. Whether new conceptions in atomic physics come from Copenhagen or from Cambridge, England; whether the cure for cancer is developed in New Haven or in Berlin; whether it is a Russian or an Italian or an American who takes the next step forward in mankind's struggle with virus diseases—we are all of us, under whatever flag, the joint beneficiaries of the intellectual property of the race. In all the clash of competing nationalisms there is here an underlying principle of unity: the single aim and language of science in the discovery of truth. It is this principle which challenges the twentieth century with the conception of civilization as a co-operative achievement and with the ideal of intellectual capital as an international possession.

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A foundation, therefore, whose aim is to assist in pushing out the boundaries of knowledge must necessarily work wherever the best tools are to be found. In its search for high talent and promising opportunities it must assume that frontiers are not the forbidding barriers they pretend to be.

This ideal, which for more than two decades The Rockefeller Foundation has consistently attempted to follow, has in recent years encountered serious difficulties. And these difficulties are increasing. Objective scholarship is possible only where thought is free—and freedom can exist only where there is tolerance, only where there are no 'Keep Out' signs against the inquisitive and questioning mind. Disinterested research cannot survive in an atmosphere of compulsion and repression. It withers under the efforts of governments to impose uniform ideologies and to circumscribe in the interests of a dominant regime the area of intellectual liberty. Particularly in the broad range of subjects covered by the social sciences, and in the humanities as well, the world has recently witnessed in several countries the progressive disintegration of creative scholarship.

This phenomenon has naturally affected the programme of the Foundation. In some fields it is now profitless to go where we formerly went. We find ourselves stopped at some frontiers—not because the frontiers have any greater geographical significance than they had a few years ago, but because behind them the search for truth by eager and sceptical minds has been made impossible.

Some twenty years ago in a Central American city a revolution developed while the Foundation was engaged in a study of yellow fever control measures. Dr. Emmett Vaughn, who was in charge of the work, determined to continue his research. Every morning with a flag of truce he crawled through the barricades to collect his mosquitoes on one side of the fighting line, and in the afternoon he crawled back again to gather up his specimens on the other side. He was molested by neither army. Both sides thought him somewhat crazy—a man who, when great issues of human destiny were being fought out, spent his time catching mosquitoes. To-day in that Central American country the revolution has been largely forgotten, but Dr. Vaughn is remembered as the man who helped to stamp out an age-long pestilence.

The Rockefeller Foundation likes to think of this incident as an example of what its approach to the welfare of mankind should be. But occasionally aggressive action by the fighting lines makes impossible even the gathering of mosquitoes.

Public health: a world problem

Laboratory techniques have been brought to the assistance of field work all over the world in influenza, scarlet fever, tuberculosis, yaws, syphilis, rabies, and the common cold. Schools have been established for the training of public health personnel; and governmental agencies, national and local, have been assisted in building up more adequate health departments. Altogether, the Foundation has operated in 77 different countries and colonies and has expended approximately $63,000,000 on public health work.

ANNUAL REPORT OF THE PUBLIC HEALTH COMMISSIONER WITH THE GOVERNMENT OF INDIA FOR 1936

VOLUME II

THE HEALTH OF THE ARMY IN INDIA

Malaria.—It was predicted that 1936 would be a bad year for malaria in India, but, in so far as the Army was concerned, expectations were not fulfilled and except for Northern Command and Burma District there was a general decrease.

The increase of malaria in the Northern Command was an aftermath of the Mohmand operations of 1935. During these operations 'delay-action' quinine was given to the men in camps which were notoriously malarious. While this had the effect of keeping men at duty it reacted later by producing an increased number of relapse cases and latent fresh infections during the following spring. In addition in the Rawalpindi District the breeding season extended into late November with many admissions during that month.

The reason for Multan being now the most malarious military station is considered to be due to the change in climatic conditions, with increased humidity and rainfall, which has become apparent in the areas affected by new irrigation from the river Indus. Increased malaria in Hyderabad is attributable to the same cause. The results already noted caused by 'delay-action' quinine in the Mohmand operations account for the increased incidence in Peshawar and Landikotal.

Routine treatment has been by (1) atebrin 0.3 gramme daily for seven days followed after an interval of three days by plasmochin 0.03 gramme daily for five days. In some hospitals quinine is given for the first 48 hours after admission, and prior to the administration of atebrin, or (2) quinine 20 grains with plasmochin 0.03 gramme daily for 21 days.

The relapse rate for all-India still remains at almost half that prevailing in 1932, *e.g.*, 18.7 per 1,000 as compared with 34.9 per 1,000 in 1932.

Dengue.—The incidence of this disease shows a still further decrease this year, there having been 244 cases compared with 262 in 1935.

The complete absence of dengue among troops in Karachi last year has not been sustained. Although there were 18 cases among British troops in the station, there was only one case among Indian troops.

Sandfly fever.—There has been a reduction in the incidence of this disease but it still ranks third in the causes of sickness among British troops in India being, with the exception of minor septic diseases, next in importance to malaria.

The Northern Command bears the greater part of the brunt of this disease as in fomer years, Landikotal and Peshawar being the stations particularly affected.

Pyrexia of uncertain origin.—There has been a steady decrease of these cases in the last five years.

The following figures illustrate the decrease in the use of the term P. U. O.:—

1932	106
1933	61
1934	46
1935	37
1936	10

Oriental sore.—At the end of 1935, the number of cases of oriental sore in Quetta, where the disease is endemic, was found to be increasing and early in 1936 the disease began to assume epidemic proportions among the local population in city and cantonment.

Although conditions prevailing after the earthquake in May 1935 might be considered favourable for increased breeding of sandflies in the piles of debris, no such evidence was forthcoming and the irregularity of infection among units in relation to proximity to the ruined city did not suggest infection from sandflies breeding in the ruins. The chief predisposing factor was probably that during July, August and September 1935, when infection probably occurred, the majority of the population were living under abnormal conditions and the risk of infection was greater.

Over 600 cases of all classes were treated at Quetta. Included in this number were 34 cases among British troops in Quetta. In addition there were 26 cases in a battalion of British troops in Secunderabad which had left Quetta at the end of 1935.

Treatment found eventually to give the best results consisted of curettage under gas followed by application of pure carbolic acid, the wound then being covered with elastoplast and left for two weeks. A modification of the above was used latterly in the Indian Military Hospital. After curettage, tannic acid was dusted on the wound to minimize bleeding and,

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for the sake of economy, sterile vaseline was used instead of elastoplast with equally successful results.

In very extensive cases, especially those with multiple sores on the face, sodium antimony tartrate was given intravenously starting with ¼ grain and increasing on alternate days by ¼ to 1¾ grains up to 10 to 15 grains. Trivalent antimony compounds were found to be more effective than the pentavalent.

Fevers of the typhus group.—Forty-four cases occurred among British troops as compared with 19 in 1935. In addition 47 cases were diagnosed among Indian other ranks. Owing to the difficulty in the differential diagnosis of certain of the mild cases without any trace of a characteristic rash the above may be understatements. As in previous years the cases fall into three main groups on their agglutination reactions. Of 108 cases (including other categories than British other ranks and Indian other ranks) only 13 could not be classified owing to approximate rises in agglutination titres of two or more members of the Proteus OX group—*e.g.*, Proteus OXK British—29, Indian—9, Proteus OX19 British—9, Indian—32; Proteus OX2 British—9, Indian—7; unclassified British —6, Indian—7.

A possible significant point which might affect any conclusions based on the distribution of the disease in commands and stations and also in seasonal incidence is the curious manner in which the majority of the cases occur in stations in which district or brigade laboratories are located. In 1936 only 9 cases seemed to occur in stations at any distance from a military laboratory. The very few cases reported among the civil population in India annually is probably similarly due to the lack of laboratory facilities for fever cases among the mass of the population. In a large number of the milder cases in the military population diagnosis without repeated agglutination tests would not have been possible.

Enteric group of fevers.—In 1934 the incidence was the lowest ever recorded, but again this record has been broken by the even greater reduction in 1936, which is particularly striking among Indian troops. It is possible that a portion of the reduction among enteric group cases is due to increasing knowledge of the mild typhus group cases, but this would not apply to the great reduction in both typhoid and para-typhoid A group (Indian) which occurred during the year and the ratio per 1,000 for typhus fever (Indian) is identical with that in 1934. The numbers of deaths in both British and Indian troops from enteric fever are also greatly reduced. There has been no corresponding reduction among the civil population but rather an increase, and although strict attention to the general hygiene of military areas is very much to the fore, there have been no dramatic changes in this respect. Increasing interest is being taken by all Indian units as regards child welfare among their families and numbers of enteric group cases who previously would have escaped notice are now being brought to light and properly treated. It is possible therefore that another focus of infection is being eliminated. The main answer however appears to be in the improvement in the T. A. B. vaccine both from the R. A. M. College, and the Central Research Institute, Kasauli, which has taken place during the past few years.

Dysentery, diarrhœa, colitis and amœbic hepatitis.—During 1936 the admission ratio for dysentery decreased by 4.6 per 1,000 as compared with 1935 and is the lowest for some years. This is however offset by an increase in admissions for diarrhœa and colitis leaving a decrease of 1.4 per 1,000 for the whole group of diseases. Reduction also occurred in admissions for amœbic hepatitis, and only two cases of liver abscess were admitted during the year.

Cases were as usual sporadic and no epidemics occurred.

The fly season corresponded as usual with the greatest incidence of the cases and in Northern Command it was noticed that units arriving recently in stations after train journeys produced small crops of cases. The fact that this group of disease is under peace conditions largely passed on from the insanitary conditions prevailing among the civil community was stressed in the 1935 report.

The striking range of the fly and the absence of any reliable method of producing active immunity against the numerous varieties of dysentery bacilli prevalent among the population of India account mainly for the fact that the admission rate to hospital among British troops is in the year 1936 still as high as 42.1 per 1,000 as compared with an admission rate of 1.5 per 1,000 for the enteric group of fevers.

The extent of the infection among the local population may be gauged by the fact that during the routine examination of menials prior to employment the majority of pathogenic bacilli discovered are mainly of the Flexner and Shiga group.

The percentage of dysentery cases diagnosed bacillary, bacillary exudate, protozoal and clinical dysentery throughout India during any one year now varies very little.

Cysticercosis.—One case occurred at Trimulgherry and was invalided to England. The man was a pork butcher in England before joining the Army. On reporting sick for a minor injury of the hand he was found to have subcutaneous nodules in various parts of his body and he stated that these had been present for seven months. Subsequently he had an epileptiform fit.

In addition to this case of cysticercosis 17 cases of epilepsy were invalided home during the year without any association with cysticercosis being discovered.

There were 17 cases of *Tænia solium* infestation treated during the year, compared with 24 during the previous year.

Venereal diseases.—Owing mainly to a reduction in Burma the admissions for venereal disease are lower than last year and slightly lower than the average of the last five years.

Cerebro-spinal fever.—One case occurred among British troops in Rawalpindi. This case was severe and resulted in death in spite of energetic treatment with group I antimeningococcus serum given intravenously, intrathecally and intramuscularly. There were 16 cases with 4 deaths among Indian other ranks and 4 cases with 3 deaths among Indian followers.

Of 14 strains of meningococci cultured 11 were found to belong to group I (type I or III). The remaining 3 strains were not typed.

Smallpox.—There were seven cases of smallpox during 1936, compared with eight in 1935. Four of the cases were among British other ranks, one was a British officer and the remaining two were children of British soldiers. One child aged 4½ years had been vaccinated eight times but always unsuccessfully. The other, aged 11 months, had not been vaccinated, as the mother refused. Both of the children and one of the British other ranks, who had been revaccinated in 1933, died.

Respiratory diseases.—The number of admissions for respiratory diseases, other than pulmonary tuberculosis, was 1,210 or 23.2 per 1,000, being practically the same as in 1935.

There were 132 cases of lobar pneumonia with 14 deaths compared with 164 cases and 19 deaths in 1935. Out of 51 cases of broncho-pneumonia there were six deaths. There were 834 admissions for bronchitis and 90 for pleurisy.

Tuberculosis.—There were three more cases and two less deaths but 28 more invalids for pulmonary tuberculosis than in 1935. The cases were distributed throughout India, although Southern Command gives a somewhat higher ratio of infection than the other Commands. There was also no higher incidence in any one unit.

Effects of heat.—There were 13 cases of heat-stroke with three deaths, and 39 cases of heat-exhaustion with one death. The number of cases of heat-stroke is two more than in 1935 but there were only half the number of cases of heat-exhaustion.

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BENGAL PUBLIC HEALTH REPORT FOR THE YEAR 1936. BY LIEUTENANT-COLONEL A. C. CHATTERJI, M.B., D.P.H., I.M.S., DIRECTOR OF PUBLIC HEALTH

THE statement below shows the comparative birth and the death rates and the natural increase in 1935 and 1936:—

	1935.	1936.
Birth rate ..	32.7 per mille	33.5
Death rate ..	22.7 „ „	24.5
Natural increase ..	10.0 „ „	9.0

Compared with the preceding year, death rates were higher from all principal causes, cholera by 25 per cent, smallpox by 800 per cent, fevers by 1.4 per cent, dysentery and diarrhœa by 10 per cent, respiratory diseases by 11.8 per cent, injuries by 25 per cent and all other causes by 5 per cent. In plague only there was a reduction of 50 per cent inasmuch as there was one death in the year under review against two in the preceding year. The infantile death rate also increased by 7.8 per cent. Thus, it will appear that the health of the province during the year under review was comparatively worse than that of the previous year.

Calcutta alone accounting for 20 deaths from it. The provincial death rate from this cause was 0.01 per mille. The figures for the previous year being unavailable, no comparative statement could be furnished.

ANNUAL REPORT ON THE MEDICAL INSPECTION OF SCHOOL CHILDREN IN THE FIVE MUNICIPAL TOWNS OF PESHAWAR, BANNU, DERA ISMAIL KHAN, KOHAT AND ABBOTTABAD OF THE NORTH-WEST FRONTIER PROVINCE DURING THE YEAR JULY 1935 TO JUNE 1936. By K. C. UPPAL, M.B. (PB.), D.P.H. (LOND.), OFFICIATING ASSISTANT DIRECTOR OF PUBLIC HEALTH

THE total number of boys medically examined during the year under report was 16,315.

Uncleanliness.—Fourteen per cent of children were found unclean during the year as compared with 13 per cent during the year before. There is a small increase in the number of unclean boys in Peshawar, where 17 boys out of 17,684 were found unclean as compared with two out of a total of 18,723 during the last year. This is being due to large number of fresh admissions in the new session. Cleanliness surveys are regularly held twice a week in all the schools in Peshawar. The number of boys found unclean in Bannu is on the decrease. Out of a total of 9,531 examinations, 2,536 or 26 per cent were found unclean as compared with 2,846 out of a total of 9,072 or 31 per cent. Intensified educative health propaganda is required to be carried out among the parents there.

Skin diseases.—8.6 per thousand of children were found suffering from skin diseases as compared with 8 per thousand during the previous year. The small increase does not call for any comment.

Dental diseases.—Eight per cent of children were found suffering from dental diseases as compared with 7 per cent during the year before. There is a negligible increase in the number of dental cases in Peshawar. In Bannu and Abbottabad the number has decreased, while Dera Ismail Khan returns the same number as last year and Kohat again shows an increase. This increase is only apparent because children in the infant classes were more thoroughly examined this year in Kohat.

Affections of ear, nose and throat.—Two per cent of children were found suffering from these troubles as compared with the same number during the previous year.

Enlarged tonsils and adenoids.—Five per cent of children were found suffering from these ailments

ANALYSIS OF FEVER DEATHS IN 1935 AND 1936

Causes	Number		Death rates per mille		Percentage of increase + or decrease — in 1936	Percentage to total fever mortality	
	1935	1936	1935	1936		1935	1936
Malaria fever ..	342,955	337,647	6.9	6.8	— 1.5	48.6	47.1
Enteric fever ..	8,709	8,359	0.17	0.17	± 0.0	1.2	1.2
Measles	3,326	4,549	0.07	0.09	+28.6	0.5	0.6
Relapsing fever (spirochætal).	8	7	0.0001	0.0001	± 0.0	0.001	0.001
Kala-azar	17,469	21,161	0.35	0.42	+20.0	2.5	2.9
Influenza	3,616	2,502	0.07	0.05	—28.6	0.5	0.3
Cerebrospinal fever ..	Not recorded separately.	910	Not recorded separately.	0.02	..	..	0.1
Typhus fever ..		1,551		0.03	..	..	0.2
Blackwater fever ..		115		0.002	..	..	0.02
Other fevers ..	329,545	339,341	6.6	6.80	+ 3.0	46.7	47.4

6,007.3 lb. of quinine were sold through post offices in 1936 against 7,781.1 lb. in 1935 and 8,589.1 lb. in 1934. Compared with the previous year twenty-two districts showed a reduction in the sale of quinine in 1936. Calcutta and two other districts (24-Parganas and Dinajpur) in which there were reduction in the consumption of quinine showed an increase in fever indices. Chittagong once more headed the list in the average sale of quinine per head of population.

Pneumonia.—Since 1923, this disease has been steadily on an increase taking larger tolls of lives every year. During the year under report, there was an increase of mortality from it both in the rural and the urban areas including Calcutta. In the whole province, the death rate from it increased by 16.7 per cent, in the rural areas by 18 per cent, in the urban areas by 13.4 per cent and in Calcutta by 16.8 per cent.

Pulmonary tuberculosis.—Pulmonary tuberculosis took a toll of 15,266 lives from Bengal with a death rate of 0.31 per mille in 1936 against 16,524 with a death rate of 0.33 per mille in 1935. Compared with the previous year, there was thus a decrease of 1,258 deaths or 6 per cent in death from this cause in the whole province. The variation in the death rates in the rural and the urban areas was too slight to deserve mention. As in the previous year 68.8 per cent of the total deaths from this cause in all towns occurred in Calcutta alone.

Leprosy.—During the year 1936, 494 deaths from leprosy were reported in the province, of which 459 were from the rural and 35 from the urban areas,

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This cannot be brought about until the living conditions and facilities for training in our hospitals are greatly improved. With this object in view the executive committee of the Dufferin Fund have earmarked the unspent balance of the Silver Jubilee money amounting to Rs. 71,300 for grants for re-building and improving nurses' quarters, for increasing teaching equipment in training schools for nurses and for providing teaching allowances for sister tutors and salaries for additional staff nurses. It is also proposed to award scholarships to trained nurses to enable them to take courses in administration in large hospitals to fit them for administrative posts.

ANNUAL REPORT OF THE HEALTH DEPARTMENT, MUNICIPALITY OF SINGAPORE, FOR THE YEAR 1937

THE most remarkable thing in this report is that since 1928 there has not been a single case of cholera reported, there has been only one case of plague since 1930, which case occurred in 1933, and the year under report has also been free from smallpox.

ANNUAL PUBLIC HEALTH REPORT OF THE CENTRAL PROVINCES AND BERAR FOR THE YEAR 1936

THE death rate during the year 1936 was 34.89 per thousand of the population, or 2.79 higher than the average during the preceding five years and was the highest in British India. The Director of Public Health has been asked to submit considered proposals for a properly organized public health service, manned by adequate and trained personnel, on which emphasis has been laid by the Central Advisory Board of Health at its inaugural meeting.

Malaria took the heaviest toll of human life, accounting for 61 per cent of the total mortality from all causes. Any radical engineering and other works to mitigate the danger from malaria are at present impracticable owing to their prohibitive cost. Government desires, however, that the only remedial measure available at present, namely, quinine, should be made accessible to the greatest possible extent and will sympathetically consider proposals for its cheaper and more widespread distribution through non-official and other agencies. Local bodies have a special responsibility in this matter and adequate funds should be set aside by them for the increased and more extensive supply of quinine.

Mortality from plague has been steadily declining. Many endemic foci of infection, however, still persist, pointing to the necessity of the continuance of vigorous anti-plague measures, particularly the destruction of rats. Mortality from cholera was also half of that in 1935 and was lower than the quinquennial average by 0.13 per mille. Other infectious bowel diseases (typhoid and dysentery) caused mortality which, although not so sudden and acute, was quantitatively as serious as that from cholera. Combined with diarrhœa, they were responsible for a death rate of nearly 3 per mille or 4½ times more than that caused by cholera. The main causes of this avoidable mortality are bad water-supply, unsatisfactory conservancy and inefficient drainage. Government is anxious to see that improvement in urban and rural water-supply is accelerated and every effort is made to secure better protection of water used for drinking and domestic purposes.

There has been a fall amounting to about 90,000 in the number of vaccinations performed. The lower mortality reported from smallpox is not necessarily an indication of improvement, as there is reason to suspect that deaths from smallpox are often attributed wrongly to chickenpox.

Although the number of deaths among infants under one year of age was slightly less than during the preceding year, the rate of infant mortality continued to be appallingly high, *viz*, 234.98 per thousand births. The maternity and child welfare movement continued to make progress. The number of child welfare centres increased from 7 to 71, while the total attendances increased from 43,508 to 559,282. If any appreciable improvement is to be brought about, local bodies must associate themselves more and more actively and directly with welfare work and the public generally and more especially those who are in affluent circumstances must evince greater interest in this movement.

The year marked further progress in anti-leprosy work. Two more clinics were opened bringing the total to 32. The attendance at these clinics rose by 5,350 and the treatment is being increasingly appreciated. Government considers that the spread of this disease can be effectively checked if public opinion insists on the segregation of lepers and would like to see greater propaganda carried on in this direction.

ANNUAL PUBLIC HEALTH REPORT OF THE PROVINCE OF ORISSA FOR THE YEAR 1936

Incidence of the chief diseases.—The statement below shows the ratios per 1,000 of population under the chief heads of mortality in 1936.

	Rural	Urban	Combined
Cholera	1.2	0.8	1.1
Smallpox	0.6	0.2	0.5
Fevers	14.3	7.0	14.0
Dysentery and diarrhœa	2.3	2.8	2.3
Respiratory diseases ..	0.7	1.7	0.7
Injuries	0.4	0.4	0.4
All other causes ..	8.6	8.4	8.6
TOTAL ..	28.1	21.3	27.8

The highest death rate, 14.0, was recorded from fevers, but in the absence of correct diagnosis it is not possible to say what percentage of deaths under fevers is definitely due to malaria.

ANNUAL REPORT OF THE LEAGUE OF NATIONS HEALTH ORGANIZATION, EASTERN BUREAU, SINGAPORE, FOR THE YEAR 1937

THIS report is a valuable record of the history of epidemic and infectious diseases for the area over which it operates. It does not lend itself to abstraction because the information given in it has already been condensed from longer reports, but it should be in the hands of all public health and port medical officers throughout that portion of the world with which it deals.

Correspondence

EFFECT OF LARGE DOSES OF PRONTOSIL

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—On the 21st of September at about 5-30 p.m. I was called in to see two young girls, aged 4 and 5 years, who had eaten 8 and 3 tablets of Prontosil red respectively at 12 noon. At 3 p.m. the former was a bit dull and at times unsteady in gait. The temperature was 99°F., pulse 120, and respiration 30 per minute. The urine was reddish. 'Fruit salts', two teaspoonfuls, was ordered. During the night the girl passed three reddish watery motions. The next morning the colour had almost disappeared.

The elder girl had no more symptoms than a slight discoloration of the skin.

Yours, etc.,

BALKRISHNA N. MEHTA, M.B., B.S.,
Medical Officer.

JUNANSINHJI DISPENSARY,
BHAVNAGAR,
14th October, 1938.

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CARE AND AFTER-CARE OF THE TUBERCULOUS

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—A copy of the *Indian Medical Gazette's* Special Tuberculosis Number has just come to hand. May I send you my very hearty congratulations on this excellent number? For a long time it has been felt in this country that there should be a forum where the question of tuberculosis in India could be brought forward *in a complete comprehensive picture.* I feel that your Special Tuberculosis Number goes far to fulfil this need.

May I express the hope that the *Indian Medical Gazette* will give consideration to a suggestion recently made to me that a more frequent Special Tuberculosis Number would receive a very sincere welcome in India?

To mark this September issue which contains a reprinted report on the International Union's Committee for After-Care and Rehabilitation, I will be glad to offer 50 copies of this Report to readers of the *Indian Medical Gazette* who will write to me for them.

Yours, etc.,

P. FRASER,

Secretary, Empire Conference on the Care and After-Care of the Tuberculous.

OVER-SEAS HOUSE,
ST. JAMES'S,
LONDON, S.W.1,
12th October, 1938.

SIPHUNCULINA FUNICOLA

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—In the *Indian Medical Gazette* of (*i*) January 1938, page 17, (*ii*) April 1938, page 254, (*iii*) August 1938, page 468, you published articles and letters on the subject of the breeding places of *Siphunculina funicola.*

Since 24th March, 1937, I have been carrying out an investigation to try and find out the natural breeding places of the *Siphunculina funicola* fly in this area.

I can now report definitely that the *Siphunculina funicola* in this area breeds naturally in thatch grass, and that in this area it has never been found to breed in ammoniacal soil or decaying vegetation.

In this investigation we have examined nearly 800 collections (boxes or bottles) of material, running into thousands of separate microscopical examinations.

Up to this hot weather season of 1938, though we had bred the *Siphunculina funicola* in thatch grass, we never succeeded in breeding it out in numbers. During the present year, however, with a slight alteration in our technique we have bred many *Siphunculina funicola* flies in the thatch grass in which eggs, larvæ and pupæ were found; in these experiments no media was used except the original thatch grass in which the *Siphunculina funicola* in its young forms were found. In all, on 27 occasions, flies have been hatched out in different batches, giving a total of fifty-five of these flies hatched, from and in thatch. One specimen produced twenty flies; seventeen of these were actually examined alive and three found dead. This piece of thatch was collected on 8th August, 1938, and on it eggs and larvæ were found, batches of flies hatched out on 14th, 15th and 29th August, 1938.

Some of these actual flies were sent to Professor P. A. Buxton of the London School of Hygiene and Tropical Medicine, and he identified them as the *Siphunculina funicola* fly, further he forwarded the specimen on to Dr. Curtis W. Sabrosky in the U. S. A., who critically examined the flies and pronounced them to be the *Siphunculina funicola.*

One interesting fact in connection with this last experiment is that, on the same date as a batch of these flies hatched out, we hatched a batch of flies from a specimen of ammoniacal soil, and sent these flies also to Professor Buxton, who states that—'those bred from soil are not *Siphunculina funicola,* but belong to the family of *Borboridæ*'—'the other tube you sent me (*i.e.,* the tube of thatch flies) contains *Siphunculina funicola*'.

Some other specimens of flies which bred from thatch have also been examined in the School of Tropical Medicine, Calcutta, and pronounced to be the *Siphunculina funicola* by Dr. D. N. Roy, assistant professor of entomology.

A further fact of great interest is that on 30th April, 1938, thatch containing *Siphunculina funicola* eggs was collected (8 pieces of thatch averaging $\frac{3}{4}$ inch by $2\frac{1}{2}$ inches long); from this thatch three adult *Siphunculina funicola* flies were hatched out on 31st May, two on 11th June, and from that date to 1st November no further flies were hatched out, but on 1st November two further flies hatched out (I think actually the flies must have hatched out on the night of 31st October, as we examined the tube on the morning of 1st November when we found flies). This means that fly eggs in thatch are viable for a very long period, in this case six months already. In the funnel tube in which we are carrying out this experiment we also found, on 1st November, pieces of pupal skin, one dried up dead larva and several eggs, some dried up and some looked quite healthy.

I am compiling a complete report of this investigation, and will publish it together with photographs of specimens. However, as so much has been written of late concerning this fly, I think it is time that these results were published.

Yours, etc.,

C. S. P. HAMILTON, D.S.O., M.R.C.S., L.R.C.P.,

Chief Medical Officer, Juri Valley Medical Association.

KAPNAPAHAR TEA ESTATE,
JURI P. O.,
SYLHET,
4th November, 1938.

Service Notes

APPOINTMENTS AND TRANSFERS

MAJOR-GENERAL N. M. WILSON, O.B.E., K.H.S., is permitted to resume his duties as Surgeon-General with the Government of Madras, with effect from 21st September, 1938, forenoon, on the termination of his appointment as Director-General, Indian Medical Service.

Colonel A. C. Munro to be Officiating D. D. M. S., Northern Command, in addition to his other duties. Dated 21st September, 1938.

Lieutenant-Colonel B. Prasad to be Officiating A. D. M. S., Presidency and Assam District. Dated 9th September, 1938.

Lieutenant-Colonel R. F. D. MacGregor, M.C., an Agency Surgeon, on return from leave, is employed as Residency Surgeon, Hyderabad, with effect from the afternoon of the 15th October, 1938.

Lieutenant-Colonel G. R. McRoberts to resume his appointment of Senior Specialist in Medicine, Madras, with the duties of Professor of Medicine, Medical College, and Physician, General Hospital, Madras, with effect from the date of taking charge.

Major M. K. Kelavkar on expiry of his leave resumed charge of the Medical Store Depôt, Lahore Cantonment, on the forenoon of 3rd September, 1938.

Major R. Linton, on the expiry of his leave *ex*-India, is re-appointed to be Civil Surgeon, Dacca, *vice* Major E. G. Montgomery granted leave.

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Captain E. Parry to be Surgical Specialist, Army in Burma. Dated 28th August, 1938.

Captain J. L. Mewton to be Specialist in Gynæcology, Peshawar District. Dated 1st September, 1938.

Transferred to Civil Employment

Captain F. W. Whiteman, on 8th September, 1938, to Bihar.

Captain J. W. D. Goodall, on 8th September, 1938, to Bengal.

Captain F. V. Stonham, on 27th September, 1938, to the Punjab.

Captain J. W. D. Goodall, on arrival in Bengal, is posted to Midnapore as Civil Surgeon, *vice* Dr. Rash Behari Datta.

Captain G. B. W. Fisher, on return from leave, is appointed as Civil Surgeon, Bakarganj, *vice* Dr. W. A. Browne.

The Secretary of State for India has appointed Lieutenant R. Passmore, to the Civil Branch of the Indian Medical Service, with effect from the 2nd March, 1938. He will continue to be employed in the Medical Research Department as Assistant Director, Nutrition Research, Coonoor.

The undermentioned officers are restored to the establishment:—

16th August, 1938

Lieutenant (on probation) R. D. D. Birdwood.

1st September, 1938

Lieutenant (on probation) H. C. Rogers, with seniority from 1st September, 1937.

Lieutenant (on probation) E. L. Wilson.

Lieutenant (on probation) J. E. Ennis.

LEAVE

Lieutenant-Colonel H. S. G. Haji, M.C., Officer Commanding, Indian Military Hospital, Secunderabad, proceeded on 6 months and 20 days' combined leave *ex*-India on the 12th September, 1938.

Captain R. D. MacRae, an Officiating Agency Surgeon, is granted leave on average pay for 4 months combined with study leave for 6 months and leave on half-average pay for 2 months, under the Fundamental Rules, with effect from the afternoon of the 15th October, 1938.

Captain C. J. H. Brink, Residency Surgeon, Kashmir, is granted leave on average pay for 26 days, with effect from the 1st November, 1938, or any subsequent date from which he may avail himself of it. His services are replaced at the disposal of the Defence Department on the expiry of the leave.

PROMOTION

The undermentioned Indian Medical Service officers were advanced to the List of Specially Selected Lieutenant-Colonels with effect from the dates mentioned against each:—

Lieutenant-Colonel (now Colonel) R. S. Townsend, M.C. Dated 1st April, 1937.

Lieutenant-Colonel (now Colonel) G. G. Jolly, C.I.E., V.H.S. Dated 16th September, 1937.

Lieutenant-Colonel (now Colonel) E. S. Phipson, C.I.E., D.S.O. Dated 16th November, 1937.

Lieutenant-Colonel F. A. Barker, O.B.E. Dated 1st April, 1937.

Brevet-Colonel R. N. Chopra, C.I.E., K.H.P. Dated 1st April, 1937.

Lieutenant-Colonel T. C. Boyd. Dated 1st December, 1937.

Majors to be Lieutenant-Colonels

G. D. Malhoutra. Dated 16th October, 1938.

J. Carrey. Dated 24th October, 1938.

Captains to be Majors

V. E. M. Lee. Dated 1st August, 1938.

E. P. N. M. Early. Dated 6th August, 1938.

G. F. Condon. Dated 15th August, 1938.

D. P. Mitra. Dated 1st September, 1938.

N. J. U. Mather. Dated 18th September, 1938.

T. D. Ahmad. Dated 6th October, 1938.

M. Jafar. Dated 9th October, 1938.

Lieutenant (on probation) to be Captain (on probation)

W. Laurie. Dated 8th June, 1938, with seniority from 10th September, 1937.

RETIREMENTS

Lieutenant-Colonel H. K. Rowntree, M.C. Dated 22nd September, 1938.

Lieutenant-Colonel E. S. Goss, M.C. Dated 25th September, 1938.

RELINQUISHMENT

Lieutenant G. K. Beatty relinquished his probationary appointment in the Indian Medical Service, with effect from the 2nd August, 1938.

Notes

HISTORY OF THE RUTHIN CASTLE CLINIC

IN 1912 Dr. David Lawson suggested to Dr. E. I. Spriggs that he should become the head of a sanatorium for gastric disease. He consented, but desired that the work should embrace all internal medicine. Dr. (now Sir Edmund) Spriggs was recovering from a long illness and had been advised not to return to London, where he was a physician on the staff of St. George's Hospital. Dr. Lawson then formed a small limited company with himself as chairman. Duff House, Banff, was acquired and equipped. Dr. Edmund Spriggs was appointed senior physician.

The new features in an institution for private patients were that, in addition to a nursing staff, it was provided with whole-time doctors and trained workers in chemistry, bacteriology and *x*-rays laboratories, a special dietetic staff, dispensary, and apparatus with skilled attendants for massage, baths and physical treatment, all under one roof.

Duff House was well supported by the profession from the first. The War depleted institutions and practices and in those years it was run, as regards the men, with a changing staff of those who were physically not sound or over age. The work was, as elsewhere, overcome with difficulty. Free beds were provided for a number of officers, and duty was also done in the hospital for soldiers at Banff.

After the War there was a demand to be nearer the centres of population. The work also increased and it became necessary to enlarge. The directors were unable to buy Duff House and it was decided to move to Ruthin Castle, which, with 500 acres of land around, was bought. Large additions to the Castle were made, and the clinic was opened there on 11th April, 1923.

The principle of inclusive charges for all services has been followed throughout. The patient knows then what the charges will be. The doctor in charge can also pay as many visits as he likes or order any test or treatment, without increasing the cost to the patient.

The clinical workers have practised throughout as consulting physicians, co-operating with the family doctor of the patient, and with other consultants. Full technical reports are sent to the patient's medical attendants.

In the twenty-five years there have been over 12,000 admissions, including many patients who have been admitted several times, suffering from all kinds of illness except infectious and mental diseases. Nearly 3,000 have suffered from disorder of the heart and arteries, about the same number from diseases of the alimentary canal and nutritional disorders, many from nervous diseases and rheumatism, the rest from all manner of illnesses.

Over 100 papers have been published from time to time, not counting addresses by members of the staff to medical societies.

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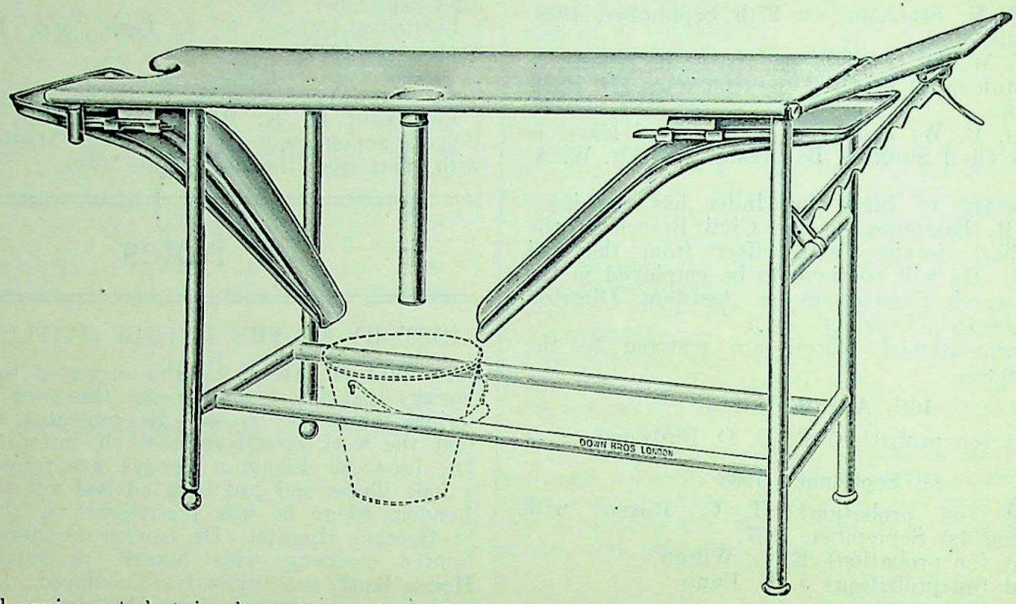
Among the subjects upon which research at the clinic has perhaps been most fruitful are medical diagnosis as a whole and the treatment of cardiovascular, alimentary, and nutritional disorders.

DISTRICT DISPENSARY OPERATION TABLE FOR INDIA

IN the small district dispensaries of India, the doctor is provided with a very limited space and also with a very limited equipment, but in those areas where the population is very scattered, he has opportunities of doing a great deal of work of all sorts, provided he is keen.



I found the difficulty was to provide him with a table on which he could do his dressings and on which also he could do those operations which he is most commonly called upon to perform, piles, fistulæ, amputations, and minor eye operations. It may be said that it is undesirable to perform such operations in the same room in which earlier in the day septic cases have been treated, but unless there is another room, which usually there is not, he has no choice. For this type of dispensary I did not find any suitable table advertised and after much discussion with various doctors who use them I was able to design the table illustrated above, the more important features of which are the following:—

It has a head plate which raises and lowers, the advantages of which need no mention, but which is also fitted with a douche tray as in the Kilkelly table, designed by my predecessor here, which prevents a patient being drowned when his eyes are washed, as no kidney-shaped tray is ever satisfactorily applied in district work. The whole table then slopes towards the centre pipe so that a patient with a septic arm can sit beside the table and have it irrigated, the washings also going into the bucket. At the opposite end, septic foot wounds can be irrigated while the patient sits or lies on the table. Both the feet at the lower end are adjustable; this enables one to overcome the usual type of floors. Nearly all the parts are easily removable for cleaning.

I have had a number of these tables in use for 5 or 6 years and they have been found most satisfactory. They have been made for me by Messrs. Down Bros., London.

E. W. HAYWARD,
Principal Medical Officer,
Jodhpur.

SALUTAN FOR BURNS AND ABRASIONS

SALUTAN is a tannic acid preparation put up in a convenient 'dredger' by C. J. Hewlett and Sons, Limited, 35-42, Charlotte Road, London, E.C.2.

The burn or abrasion is washed with some mild antiseptic solution, and the powder is dusted on; it is then covered with cotton-wool. Next day all the *loose* cotton-wool is removed and more powder dusted on the adherent wool and fresh wool placed over this. Eventually, the outer dressing is removed and the adherent wool allowed to separate naturally.

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Original Articles

MORE NOTES ON CLINICAL HEART DISEASE

By GERARD KELLY, F.R.C.P.(I.)
MAJOR, I.M.S.
Professor of Clinical Medicine, Medical College Hospitals, Calcutta

Some manifestations of elevated venous pressure in heart failure

FIGURATIVELY speaking, the systemic veins may be regarded as a reservoir filled from the periphery by blood from the capillaries and emptied by the cardiac pump. Normally, the intake and emptying mechanisms are in dynamic equilibrium. The height of the venous pressure is a gauge of the fullness of the reservoir. When, in ordinary or in acute congestive failure, the right heart fails to empty the systemic veins, the venous pressure rises. This rise of venous pressure is reflected in the venous reservoir formed by the systemic and portal venous system behind the failing right ventricle.

Engorgement of the liver.—The hepatic veins enter the inferior vena cava at a considerable angle close to its point of entry into the right auricle. The blood flow in the hepatic vein is a feeble stream as compared with that in the inferior vena cava. The liver itself is a vascular sponge. In the early stages of failure of the right heart to empty the systemic veins, the liver holds back a considerable volume of the venous return. Storage of water within the liver cells is probable. Thus, enlargement of the liver may precede the rise and persist after the fall of venous pressure. In young people the liver capsule is more distensible and so as a rule in them liver engorgement is proportionately more marked than are the other signs of right-heart failure.

Engorgement of the liver is an almost invariable consequence of failure of the right heart. Very rarely right-sided failure, including liver engorgement, may occur in left-sided failure without the intervention of pulmonary engorgement, *i.e.*, in the absence of the usual evidence of left-sided heart failure, a phenomenon which, Harrison asserts, speaks against the idea that the overworked chamber is always the one to fail first. Most usually, however, liver engorgement is conspicuously absent in isolated left ventricular failure. We have the impression that the liver is sometimes slightly congested in peripheral circulatory failure of toxic origin. The remaining causes of liver engorgement are relatively infrequent. Occasionally, liver engorgement may afford early evidence of effusion into the pericardial sac, which by resting on the diaphragm about the vena caval hiatus may exert compression especially of the mouths of the hepatic veins, which, as stated above, open into the inferior vena cava. Liver engorgement is disproportionately prominent in adhesive pericarditis because adhesions more readily kink the trunks and pinch the mouths of the hepatic veins than of the inferior vena cava. On rare occasions, a tumour mass may obstruct the proximal inferior vena cava or the hepatic veins themselves may become thrombosed.

A rare but interesting result of the increased venous pressure of right-heart failure is phlebosclerosis of the hepatic veins, which is the analogue of sclerosis of the pulmonary artery in pulmonary hypertension. Cardiac cirrhosis accompanies some cases of hepatic phlebosclerosis.

When right-heart failure is ushered in acutely, as for example by auricular fibrillation, hepatic pain and its associations may raise a suspicion of an acute abdomen. This suspicion may be heightened by the supervention of congestive vomiting. The pain is due to stretching of the liver capsule. Its localization is the right upper quadrant or the epigastrium : we shall refer presently to those cases in which pain and tenderness are localized in the epigastrium. The radiation of the pain is to the back, to the right scapula, and to the right shoulder (phrenic shoulder pain). A sharp or colicky character of the pain, local tenderness and rigidity, tympanites and the absence of any notable liver enlargement may further obstruct diagnosis. In the shock stage of coronary thrombosis such upper abdominal manifestations are not hepatic in origin : they occur reflexly from the sudden injury to the heart muscle or they are reflections of an attendant pericarditis, whilst the vomiting is probably due to a reflex from the heart through the afferent vagal fibres. The pain of acute engorgement, however, is usually of a continuous aching distressing type and is located in the right hypochondrium. It soon responds to digitalis and salyrgan. Provided the liver is not already cirrhotic, we initiate treatment with morphine gr. $\frac{1}{4}$. Leeching is a time-honoured remedy in these cases.

In chronic congestive failure the main burden of the patient's complaints is very often 'dyspepsia' or indigestion. In these cases congestion of the liver, of the stomach, of the intestines and of the pancreas produces slowness of digestion, anorexia, nausea, belching of gas, bloating of the stomach, a sensation of tension in the epigastrium and hypochondria, constipation, occasional bouts of diarrhœa, and rarely vomiting or bilious attacks. The patient may wonder where all the 'wind' comes from : 'vicarious respiration' is one answer, but not the correct one. In the tropics the possibility of a complicating amœbiasis should not be overlooked.

The influence of the time factor in the production of the signs of right-heart failure is indicated by the following observations. The acute heart failure of diphtheria and of coronary

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thrombosis may be attended within the course of a few hours by conspicuous liver engorgement and by but little or no œdema : the latter takes some days to develop. The practitioner should regard vomiting in diphtheria as an urgent symptom of impending circulatory collapse. Rapid and extreme liver engorgement in coronary thrombosis is, in Libman's opinion, highly suggestive of thrombosis of the right coronary artery. Septal infarction due to either right or left coronary thrombosis is commonly associated with high grade right-heart failure : an acquired interventricular septal defect murmur and liver engorgement may be prominent features of septal infarction, as in a recent case of ours. In an attack of paroxysmal tachycardia, the classical example of acute cardiac dilatation, downward bulging of the liver is detectable within a few minutes : with the abrupt fall of heart rate that marks the offset of the attack, the cardiac dilatation magically vanishes in a moment or two, while recession of the swollen liver is more gradual. A passing reference to acute heart failure is made elsewhere.

In his routine examination of the abdomen in a heart case the examiner should deliberately search for three important abdominal signs, namely, (1) enlargement of the liver, (2) enlargement of the spleen, and (3) ascites. He should invariably employ bimanual palpation for the detection of (1) and (2). In his quest for an enlarged liver, he should commence palpation in the right lower abdominal quadrant into which a Reidel's lobe may rarely wander. The swelling of the liver in engorgement is general and mostly downwards. Usually, the larger right lobe will be encountered projecting further down than the much smaller left lobe. Sometimes the engorged liver imparts to the palpating hand a definite impression that it is swollen, that its surface is convex and that its elasticity is increased. Ordinarily, the engorged liver feels smooth and firm; its lower border is rounded and feels thickened. In long-standing engorgement, the liver may convey the impression of hardness and its edge may feel sharp or obtuse. Tenderness at least of the liver edge is a usual finding, even in the absence of any complaint of pain. As a rule, tenderness is general over the hepatic region, *i.e.*, below the right costal margin and the epigastrium. Occasionally, pain and tenderness are localized over a small area in the epigastrium, and if in addition there is any suggestion of jaundice a misdiagnosis of gall-bladder disease is very likely. The degree of enlargement of the liver may be great or slight : generally the liver size waxes and wanes with the advance and retreat of failure. The associated *defense musculaire*, however, often prevents definition of the size of the engorged liver by palpation. In long-standing engorgement of the liver caused by heart disease, the overlying muscular rigidity usually disappears and little or no tenderness is elicited on palpation. Confirmation of liver enlargement in heart failure should be sought by percussion of the liver in the middle line from the umbilicus to the ensiform cartilage.

In minor grades of failure, designated insufficiency of the right heart with early engorgement of the liver, the examiner may observe that as he exerts increasing pressure over the subhepatic area the cervical veins on both sides of the neck become more evidently engorged. Compression of the engorged liver empties it, as if it were a sponge, driving the blood via the inferior vena cava into the dilated right auricle with consequent visible and palpable cervical vein engorgement, which subsides when pressure is released, thereby permitting once more full expansion of the liver and descent of the diaphragm. This phenomenon, described in 1885 by William Pasteur of London, is called the hepato-jugular reflux. Expansile pulsation of the liver, especially of the left lobe, documents the advanced right-heart failure of long-standing mitral stenosis or of high-grade tricuspid disease. When one hand is applied over the liver anteriorly and the other is pressed into the right loin, this liver pulse gives the impression of an accordion expanding and contracting. 'When once the liver has begun to pulsate, it probably always continues to do so till death'—Mackenzie. Much more commonly the pulsation felt over the liver is not truly expansile, but is transmitted from the heart, particularly in cases of right ventricular enlargement or of aortic incompetence.

The engorged liver of right-heart failure commonly pushes the diaphragm upwards with some degree of resultant collapse of the right lung base. This is clinically evidenced by right basal dullness and deficient breath sounds and vocal vibrations. Such pulmonary collapse is distinguished from a pleural effusion by the fact that the upper level of dullness is not higher in the axilla than behind, and that in the prone position or in deep inspiration the increased dullness is notably lessened or become imperceptible. More appropriate to the occasion is the recognition of a right hydrothorax, in that hydrothorax is not only a further sign of congestive failure but is predominantly right sided.

In ordinary right-heart failure, the liver engorgement roughly parallels the rise of pressure observable in the cervical veins, except in the congested subject who is already suffering from cirrhosis of the liver. Venous pressure may be roughly measured by inspection of the cervical veins when these are easily observable. The retreat of the liver lags behind the decline of venous engorgement. In the first attack of congestion in the average case, digitalis and salyrgan produce a remarkably rapid retraction of the liver beneath the false ribs. In subsequent attacks of congestive failure the recession of the swollen liver under the same treatment is increasingly sluggish, the dyspepsia becomes more intractable and a sub-icteric tint

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of the conjunctivæ develops. In protracted right-heart failure, the size of the liver may not decrease, in spite of marked subsidence of the signs of increased venous pressure. Peripheral œdema and transudation into serous cavities are usual but by no means invariable or proportionate accompaniments of liver engorgement in congestive failure.

The main causes of painful enlargement of the liver are congestion of the liver, amœbic abscess of the liver and cancer of the liver. Evidence of increased venous pressure, *e.g.*, cervical vein engorgement, will be found *only* in the liver engorgement of heart disease : other cardiac symptoms and signs will of course be present here as well. In liver abscess, the signs of sepsis (spiky temperature chart, rigors, sweats, wasting, anæmia and leucocytosis : the latter may be comparatively slight or even absent) will point to the correct interpretation of the liver and right basal signs : any jaundice is latent : frank jaundice should suggest a complicating epidemic catarrhal jaundice, for example, as in a recent case of ours : the stools may show *Entamœba histolytica* cysts : a previous history of dysentery or diarrhœa is sometimes helpful : radiography of the liver and a therapeutic test (emetine) are other useful diagnostic aids. Many years ago I was invited to see a 'liver abscess' prior to operation : the patient, an elderly golf caddy, was in fact a case of slow auricular fibrillation with congestive failure due to arteriosclerotic heart disease complicated by a benign tertian malarial relapse. Digitalis and quinine operated upon him instead in a most dramatic manner : digitalis and quinidine, by the way, we sometimes use with much success in selected cardiac cases.

The liver engorgement of advanced congestive failure in mitral disease or in Hanot's hepatic asystole, has in rare instances been regarded as carcinoma of the liver. However, in cancer of the liver, the liver enlargement is not only painful and tender but is also stony hard and irregular : jaundice and ascites are common accidents rather than essential signs : the spleen is very seldom enlarged in the absence of portal thrombosis : a blood-stained pleural effusion may be discoverable : the left supra-clavicular glands may be palpable : cachexia and perhaps pyrexia are present : there may be evidence of a primary growth elsewhere or an operation may have been performed for the removal of a growth within the past five years.

Other causes of painful enlargement are ascending cholangitis, associated with stone, especially in the common bile duct, pylephlebitis (portal pyæmia) due to septic appendix, suppurating hydatid cyst, and hepatic necrosis.

Splenomegaly.—The spleen is the example *par excellence* of a blood depôt. Thus, in acute or recent congestive failure slight splenic enlargement may be detected as a result of venous engorgement, whereas chronic congestive failure tends to empty the splenic reservoir, thereby leading to splenic atrophy with connective tissue hyperplasia and clinical diminution in the size of the spleen. Cardiac cirrhosis may rarely cause clinically-evident enlargement of the spleen due to portal obstruction, as in ordinary cirrhosis of the liver. Rarely have we been able to palpate the spleen in the circulatory failure of typhoid fever in the absence of enlargement due to other causes. In the absence of malaria, kala-azar, blackwater fever, undulant fever and the tropical splenomegalies, splenic enlargement is an important sign of subacute bacterial endocarditis. Enlargement of the spleen due to acute infections, such as typhoid, typhus, pneumonia, septicæmia or streptococcal fever, subacute bacterial endocarditis, and active rheumatic fever, as a rule being slight and soft, easily escapes detection. In endocarditis lenta (slow but all too sure), however, although the spleen is usually only just palpable, it may become very large from the impact of a constant stream of small emboli on the infected organ. In chronic compression of the heart, enlargement of the spleen is, equally with the attendant ascites, liver enlargement, cyanosis, peripheral œdema, hydrothorax, pulmonary œdema, varicose veins and hæmorrhoids, an expression of the prevailing venous stasis. In blood diseases, the size of the spleen may aid diagnosis : in leukæmia the spleen may seem almost to fill the abdomen : in splenic anæmia, acholuric jaundice and polycythæmia vera the spleen extends perhaps to the level of the iliac crest and to the middle line in front : in pernicious anæmia and in secondary anæmia, splenic enlargement is slight. Polycythæmia hypertonica (Gaisboeck's disease) is either polycythæmia vera with secondary hypertension or of hypertensive heart failure with secondary polycythæmia. Thrombo-phlebitic splenomegaly is commonly diagnosed as Banti's disease. Pulsation of the spleen and aneurysms of the spleen are distinct rarities. Very occasionally a well-marked continuous murmur is heard in splenic enlargements associated with venous engorgement. Splenic friction in acute leukæmia may be slight or gross. We found kala-azar complicated by a left pleuro-pneumonia in a recent case of 'fever with enlarged spleen, splenic friction and liver enlargement'. Palpability and not increased percussion dullness of the spleen is the test of splenic enlargement. The phrenico-colic ligament or rather the shorter gastro-splenic omentum in the adult, it will be remembered, makes the enlarged spleen pass forward and downwards. In children the spleen may enlarge directly downwards. Splenomegaly, especially in the tropics, is of little assistance in the diagnosis of heart disease.

Ascites.—Ascites may be defined as a collection of free serous fluid in the peritoneal cavity so that the abdomen becomes converted into a bag of fluid. Its main mechanisms are stasis in

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the portal system and inflammation or irritation of the peritoneum. Thus, ascites is either a transudate or an exudate. Indeed the main differential diagnosis of ascites lies between cirrhosis of the liver and chronic peritonitis: they are sometimes found combined in a single case. The causes of ascites in order of frequency are said by Cabot to be, (1) cirrhosis of the liver, (2) heart disease, (3) renal disease (nephritis and nephrotic œdema), and (4) tuberculous peritonitis, especially in children. In the tropics severe anæmias and lymphatic obstruction (filariasis) are important factors. In diseases of the heart, the mechanism of ascites is venous engorgement due to right-heart failure or to failure arising from chronic compression of the heart. The clinical manifestations of chronic compression of the heart are produced by venous stasis and a reduced arterial circulation. Beck has assembled a diagnostic triad which the practitioner may find helpful in the diagnosis of chronic compression of the heart. It consists of—(1) ascites and liver engorgement, (2) high venous pressure, and (3) a *small quiet* heart. In this syndrome the cervical veins stand out like goose quills and pulsus paradoxus is frequently present. Not unreasonably, Beck regards as a confusing mass of medical verbiage such terms as adhesive pericarditis, concretis pericardii, symphysis cardiaca, pericarditic pseudo-cirrhosis of the liver, mediastino-pericarditis, Pick's disease, Concato's disease, and polyserositis. The compressing agent in chronic compression of the heart may be fluid (sterile or infected), scar tissue, neoplasm, or a combination of several of these lesions. [In acute compression of the heart, as for example when a myocardial infarct or contusion ruptures, the liver has not had time to enlarge. Its diagnostic triad however is (1) low arterial pressure, (2) high venous pressure, and (3) a small quiet heart.] In protracted right-heart failure of rheumatic, arteriosclerotic or rarely syphilitic origin, recurrent ascites may figure so prominently that chronic compression is simulated. The term hepatic heart failure or asystole hepatique was used by Hanot to describe a series of congestive failures characterized by considerable liver engorgement over months or years, with recurrent ascites and without notable deterioration in the general health notwithstanding these morbid phenomena. Clinical cardiac cirrhosis is rare: its diagnostic criteria are preponderant ascites, a small liver, supernormal venous pressure and a palpable spleen. 'The sudden onset of ascites or of hæmatemesis and their recurrence, accompanied by considerable splenic enlargement, might suggest the presence of portal thrombosis'.—Rolleston. Cirrhosis of the liver, however, would be a safer diagnosis. Horder has stated that ascites arising insidiously in a woman in whom there are no other symptoms or signs for example of heart, kidney or liver disease, is generally due to ovarian adenoma.

The clinical signs of ascites are shifting dullness, fluid thrill and signs of portal-peripheral anastomosis. When testing for shifting dullness, the examiner should wait a few moments after the patient has rolled over on to his side, to permit the fluid to seep through the mesenteric and intestinal folds: it does not run over the sharply projecting spinal column as over a waterfall. Tympanites is especially common in heart failure. It commonly masks ascites. Its presence in high degree should lead to a more careful search for free fluid in the peritoneal cavity.

The tempo of accumulation of cardiac ascites is the most rapid of all forms of ascites, just as that of tuberculous ascites is usually the slowest. If the quantity of ascitic fluid is large and its accumulation has been rapid, the abdomen is more or less globular, the umbilical region is prominent and there is a tight sensation of the belly, sometimes amounting to actual pain, due to the stretching of the abdominal wall. If the quantity of ascitic fluid is large and its accumulation has been gradual, then bulging of the flanks is more prominent, the lower ribs are pushed outwards and upwards and the epigastric angle is widened. Hæmorrhagic ascitic fluid usually means cancer. The chemical characters however of ascitic fluid are of little help in the differential diagnosis of ascites. Never omit to make a rectal examination for small collections of fluid and secondary deposits from gastric cancer in the recto-vesical peritoneum and a vaginal examination. The knee-elbow position, for the detection of small collections of fluid, is a gymnastic exercise ill-borne by cardiacs: it should be omitted.

Cardiac hydrothorax.—Hydrothorax is defined as a collection of clear fluid in the pleural cavity, the result of passive transudation from the capillaries. The essential mechanism of cardiac hydrothorax is engorgement of the pleural venous system (the pleural sacs have both a systemic and a pulmonary venous drainage, *i.e.*, the superior vena cava and the pulmonary veins) with resultant increased hydrostatic pressure in the capillaries—capillary hypertension. A further factor is the lowered colloid osmotic pressure of the plasma by reason of the relative permeability to protein of the capillaries of the serous cavities. Hence in heart failure, osmotic factors associated with increased capillary permeability co-operate with capillary hypertension in the production of effusions into serous cavities as potently as does the mechanical factor of gravity in the production of œdema of the ankles and lower limbs. The combination of pulmonary and systemic congestion, *i.e.*, of left- and right-heart failure, is most favourable to the development of cardiac hydrothorax, whereas systemic venous engorgement alone determines the occurrence of peripheral œdema. Evan Bedford has found that left ventricular stress and failure with regular rhythm favours the development of left hydrothorax and that

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left ventricular failure with auricular fibrillation predisposes to right hydrothorax. The classical domain, however, of hydrothorax is right-heart failure. The theories advanced to explain the right-sided predominance of cardiac hydrothorax are at least sufficiently numerous. We have tapped a right-sided cardiac hydrothorax twelve times : this patient now has considerable ascites as well but no radiological evidence as yet of fluid in his left pleural cavity.

Although hydrothorax may herald the other signs of failure in the systemic circulation, it is more commonly masked by the gross manifestations of congestive failure. The physician should, however, make a deliberate clinical and radiological search for evidence of hydrothorax supervening in any case of congestive failure that suddenly manifests distressing oppressive dyspnœa, more evident cyanosis and a general accentuation of the signs of right-heart failure. Such a sudden worsening of the clinical status in congestive failure may be ascribed in the main to the reduced vital capacity, the interference with the pulmonary ventilation and the increased intrapleural pressure attendant upon the sudden development of cardiac hydrothorax. Further, elevation of the venous pressure is caused by the increased intrapleural pressure. The cardinal signs of hydrothorax are those of a pleural effusion—namely, (1) percussion dullness, (2) displacement of the heart, (3) annulled vocal fremitus, (4) diminished and altered or absent breath sounds—*minus* friction sounds and fever.

As transudations take place into the pleural cavity, absolute and toneless percussion dullness may be detected at the extreme base, together with a correspondingly increased sense of resistance. The dullness gradually extends upwards and slight variation of the dullness with the position of the patient may be demonstrable. The prevailing intrapleural pressure is negative, more so on the right side than on the left. Immediately fluid accumulates in the pleural cavity the lung on that side collapses. The elastic traction exerted on the mediastinum by the lung on the affected side is thus removed, leaving unopposed the traction of the sound lung with consequent mediastinal shift to the opposite side. The contents of the middle mediastinum, it will be remembered, are almost totally the heart and its coverings. Hence, when fluid is poured out into a pleural cavity, the heart is invariably and instantly displaced to the opposite side, in the absence of fixation of the heart by adhesions and of consolidation or of fluid at the opposite base : approximately one case of hydrothorax in three is bilateral. Enlargement of the heart and the possibility of an associated hydropericardium must be borne in mind in the assessment of cardiac displacement. In the latter case, the apex beat (*i.e.*, the point on the surface of the chest, furthest downwards and outwards, at which the impulse can be distinctly felt) is generally pushed upwards and to the left, and lies, when it is palpable at all, distinctly within the left border of cardiac dullness and not, as in cardiac enlargement, in close relationship with it. Absence of vocal fremitus ranks third in importance and is due to the interposition of fluid which is a poor conductor of the laryngeal vibrations to the chest wall. Routine auscultation in congestive failure commonly reveals persistent moist sounds at the bases. Diminished breath sounds and diminution of the whispered voice sound at a base in congestive failure should suggest basal collapse and attendant bronchitis consequent upon hydrothorax. A collection of 500 c.cm. or over will yield the signs described. We must not forget that hæmorrhagic infarction of the lung is a common and often repeated complication of advanced congestive failure and that it more commonly involves the lower and middle lobes of the right lung, because the right pulmonary artery affords a wider entrance for pleural emboli from the right heart and from the deep pelvic veins which latter may suffer thrombosis in cases long confined to bed.

The removal even of 500 c.cm. in cardiac hydrothorax gives the patient remarkable relief and facilitates the action of digitalis and salyrgan, much as a timely venesection may do. The character of the transudate may approximate that of an exudate.

As Evan Bedford has remarked on his paper on left ventricular failure (1939) radiological study will occasionally reveal an interlobar or encapsulated hydrothorax (hydrothorax saccatus interlobaris) due to transudation from the visceral pleuræ consequent upon pulmonary congestion.

Oliguria.—Oliguria, remarks Fishberg, is a cardinal manifestation of systemic venous stasis. In our wards the urinary output curve is shown on the temperature chart of the heart case. It depicts the progress of right-heart failure. If a patient with right-heart failure states that his urine is abundant this should excite a suspicion of complicating diabetes mellitus. Horder states, 'Both chronic nephritis and dilatation of the heart may lead to a scanty, albuminous urine. But in the case of chronic nephritis the scanty urine is usually pale, pigment elimination being diminished, is free from or has but a small deposit, the amount of albumin is always considerable, and renal casts are present. Whereas in dilatation of the heart the scanty urine is high-coloured, contains a large uratic deposit, the amount of albumin is very variable, and renal casts are absent'. Unfortunately, many heart cases are renal cases as well. In acute heart failure, *e.g.*, in coronary thrombosis, oliguria bespeaks systemic hypotension and may proceed to anuria.

Remarks

The manifestations of increased venous pressure dominate the clinical picture of right-heart

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failure, which in its pure form is not accompanied by pulmonary congestion. Dyspnœa may be caused by associated hydrothorax, ascites, and severe liver engorgement. Dyspnœa, however, is an almost invariable symptom in right-sided failure because, as we have stated elsewhere (Kelly, 1939), its causes, *e.g.*, left-heart failure, etc., essentially implicate the pulmonary circuit. Armstrong has recently described a case of heart failure restricted to the right ventricle. Evan Bedford and Harrison hold the view that unilateral hypertrophy, dilatation and failure not only may occur but usually do occur. Venesection has no place in the treatment of primary right-heart failure, or of acute right ventricular failure due to pulmonary embolism. Congestive failure is associated with cardiac enlargement except in chronic compression of the heart. The presence of marked chronic passive congestion of the liver, lungs and other viscera and of extensive myocardial lesions often render it quite unnecessary to invoke toxæmia or exhaustion to explain the advent of heart failure in subacute bacterial endocarditis.

Jaundice in heart disease

In clinical heart disease jaundice may be either latent or frank. We have already referred to latent jaundice in second and subsequent attacks of right-heart failure. Latent jaundice is evidenced by a subicteric tint of the conjunctiva and skin, or is altogether masked by attendant cyanosis. The cause of latent jaundice here, as in subacute bacterial endocarditis, is increased blood destruction, due in the first case to prolonged anoxæmia and to *Strepto. viridans* in the second case. Frank jaundice is not common in heart disease. It suggests three possibilities, that (1) severe right-heart failure has superimposed congestion upon an already damaged liver, that (2) the case is one of severe and long-standing right-heart failure due to marked mitral or tricuspid stenosis, or that (3) pulmonary infarction is now complicating congestive failure. The latter complication is suggested by an abrupt worsening of the clinical status of the patient : there is a sudden increase in heart failure and cyanosis with a sudden onset of jaundice or a sudden accentuation of any existing jaundice, or jaundice appears two or three days after the lung infarction. The coloration of frank jaundice in heart disease is less deep than that of obstructive jaundice. Cyanotic icterus connotes yellowing of the conjunctiva and facial skin *plus* cyanosis of the lips and ears : this facies is of grave import. The unusual distribution of jaundice in congestive failure was first indicated by Meakins who reported that in a case of congestive failure he observed that the œdematous lower part of the body was free from jaundice whereas the upper part was markedly jaundiced and free from œdema. This observation holds also of course for cyanotic icterus. Page later reported two cases of congestive heart failure with hemiplegia wherein the paralysed side was œdematous, and the sound side was icteric. Ottenburg (1932) explains this strange phenomenon by the low solubility of bilirubin which is held in the blood adsorbed to protein because of the lower protein content of the œdema fluid. According to Ottenberg two or more of the following factors are responsible for the production of jaundice in congestive failure—

(1) Increased production of bilirubin especially in the lungs, spleen and liver due to the destruction of red cells, as a result of the slowed circulation and prolonged anoxæmia.
(2) Profound depression of the excretory function of the intact liver cells for bilirubin as the direct result of lack of oxygen.
(3) Actual atrophy of the liver cells at the centres of the lobules as a secondary result of anoxæmia.
(4) Slowing of the circulation so that only a small fraction of the usual amount of blood passes through the liver to be cleared of its bilirubin.

Two special points emerge from the fact that anoxæmia constitutes the essential mechanism of cardiac jaundice.

(1) Failure not only of the right heart but also of the left heart seems to afford the most favourable circumstances for its production.

(2) Cardiac jaundice is a clear indication for oxygen therapy.

ACUTE HEART FAILURE

In general, the clinical picture of ordinary backward or congestive failure is dominated by upstream manifestations, *i.e.*, by congestion behind the failing left and/or right chambers, rather than by inadequate output of the failing chamber. Acute heart failure is compounded of peripheral circulatory failure (shock) and of congestive cardiac failure; for example, in coronary infarction the sudden injury to the heart not only disables the cardiac pump but also initiates peripheral circulatory failure of hæmatogenic type (secondary shock). In general, the clinical picture of acute heart failure is dominated by downstream manifestations, *i.e.*, by forward failure or by signs of acute circulatory collapse due to an inadequate blood supply to the tissues. Thus, in acute heart failure, whilst the downstream features of peripheral circulatory failure declare themselves, the upstream symptoms and signs of congestive right- and left-heart failure have to be looked for. Hence, when the practitioner is confronted with a case of acute circulatory collapse his first consideration must be as to whether he is dealing with a fundamental defect in the central cardiac pump (acute heart failure) or with a fault confined to the peripheral vascular apparatus (peripheral circulatory failure). His decision will hinge on the presence or absence of upstream manifestations. If there are no symptoms or signs of left- or right-sided congestive heart failure there can be no sort of heart failure. Hence acute heart failure will display evidence of left-heart failure, such as dyspnœa, orthopnœa, and pulmonary congestive

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râles and signs of right-heart failure, such as engorged cervical veins and liver engorgement. Collapsed cervical veins, on the other hand, bespeak a very low venous pressure significant of peripheral circulatory failure. Fishberg's implication that cases of coronary thrombosis are divisible into those with shock and those with heart failure does not constantly accord with our experience. We are of opinion that signs of heart failure appear coincidentally with shock in coronary thrombosis about as frequently as they fail to appear in coronary thrombosis without shock. The diagnosis of coronary thrombosis is further advanced by the discovery in the heart itself of signs suggestive of cardiac damage, such as heart sound failure, gallop rhythm, and cardiac arrhythmias. Tic-tac rhythm is more characteristic of peripheral circulatory failure than it is of organic heart disease: even when it does occur in organic heart disease the circulatory state is usually that of acute heart failure. Cardiac enlargement and murmurs usually have antedated infarction. The final proof of myocardial damage, *i.e.*, of infarction, is as a rule to be found in the coronary thrombotic pattern of the electrocardiogram.

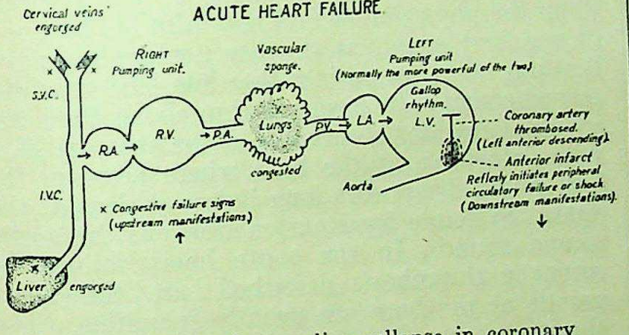

Diagram illustrating cardiac collapse in coronary thrombosis.

The clinical picture of coronary thrombosis may be summarized as follows:—

(1) Pain due to coronary insufficiency setting in acutely and producing a relative localized myocardial ischæmia and anoxæmia which not only outlasts 20 minutes but goes unrelieved by any existing collateral inter-coronary anastomotic circulation.
(2) Peripheral circulatory failure (downstream manifestations).
(3) Congestive failure (upstream manifestations).
(4) Clinical evidence of myocardial necrosis such as fever, sweating, leucocytosis or increased sedimentation rate.
(5) Persistent electrocardiographic changes.
(6) The appearance of acute pericarditis as revealed by a friction rub.
(7) The occurrence of embolism, especially in septal infarction.

Libman holds that hyposensitive individuals are more apt to exhibit coronary thrombosis in terms of shock rather than of pain. Their relative inability to feel pain may puzzle the diagnostician, not only in cases of coronary thrombosis but also in other conditions, such as duodenal ulcer. Painless coronary thrombosis, however, is commoner in those displaying some degree of congestive failure. In these latter subjects pain equivalents or substitution symptoms, usually a seizure of dyspnœa, proclaims the onset of coronary thrombosis.

Rapidly developing injury to the myocardium, productive of cardiac collapse, is likewise responsible for the induction of acute heart failure in some cases of diphtheria. We have already referred to the acute heart failure induced by paroxysmal tachycardia: other tachycardial arrythmias such as flutter and fibrillation may similarly precipitate acute heart failure. A third group of acute heart failures is due to sudden and pronounced mechanical hindrance to the heart in carrying out its work, *e.g.*, to cardiac tamponade (sudden accumulation of blood or fluid in the pericardium), massive pulmonary embolism, ball-valve thrombus obstructing the mitral orifice.

The Adams-Stokes' syndrome is the classical example of acute heart failure of syncopal type. Some cases are due to transient attacks of ventricular fibrillation and not to lesions of the conduction system; asystole results in either circumstance. The main disturbance is obviously an inadequate blood supply to the brain or rather a paroxysm of cerebral ischæmia, productive of a seizure of unconsciousness. Heart failure in cardiac syncope or the syncopal type of acute heart failure is almost instantaneous and consciousness is lost because the diminution of the cardiac output is sudden and severe. The clinical picture here resembles that of the neurogenic type of peripheral circulatory failure (primary shock), such as a pugilist may display on the receipt of a blow on the solar plexus. The characteristics of the Stokes-Adams' syndrome are bradycardia, syncope, and convulsions, even in recumbency. In the gravest attacks the patient lies unconscious and motionless. The facies, especially of the previously ruddy-faced individual, is most striking: he now presents an ashen-grey or livid corpse-like aspect with glassy dull eyes, widely dilated pupils and sometimes conjugate deviation. The cervical veins are enormously engorged. There is a gasping respiration every 30 seconds. Respiration may, however, be stertorous and suggestive of cerebral hæmorrhage or Cheyne-Stokes' breathing may develop. No pulse is felt and no heart sound is heard for 2 to 3 minutes. The sphincters are relaxed and Babinski's sign may be elicited. Then the face flushes pink and the pulse returns and the heart sounds are heard. The breathing is resumed within 1 to 2 seconds and consciousness returns within a few seconds. The patient is dazed for 15 to 30 minutes. The attack is ended.

In the cardiac collapse (coronary thrombosis) type of acute heart failure, heart failure sets in less acutely than in this cardiac syncopal type of acute heart failure. Loss of consciousness too is unusual in the former type, although we

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do see occasional cases of coronary thrombosis ushered in with loss of consciousness.

Blood pressure recordings.—The fall in blood pressure which attends the onset of coronary thrombosis has long been regarded as one of the most striking manifestations of the altered hæmodynamics of this condition. Nevertheless, in 1937 we found to our surprise that certain physicians delicately refrained from taking the blood pressure in suspected or actual coronary thrombosis. They had been unduly alarmed by the 'dangers of blood pressure examinations in coronary thrombosis' (Hyman and Parsonett, 1932). These dramatic writers alleged that the attending physician's blood pressure recordings 'undoubtedly played a sinister part' in the untimely death of an old lady of 70, who developed peripheral embolic blockage after coronary thrombosis. As I read this indictment of the unfortunate general practitioner in the case, I felt that he might well have derived a modicum of comfort from Pascal's observation: 'The doctor sometimes cures, sometimes kills, *but he always consoles*'. Whilst we deprecated frequent fussy baumanometric measurements, we nevertheless continued our rapid routine reading of the blood pressure in this emergency without any suggestion of a mishap. And so the local trepidation associated with the recording of blood pressure in coronary thrombosis quickly subsided.

Sometimes in the painful stage of coronary thrombosis, peripheral vaso-constriction associated with the attendant shock, causes an early rise to precede the fall in blood pressure which ordinarily documents coronary thrombosis. An attack of angina pectoris is often accompanied by a rise in the blood pressure but the time-test and other features generally prevent confusion. Peripheral vaso-constriction may likewise sustain or even further elevate the blood pressure in hypertensive heart failure. Indeed in 'high pressure stasis', the blood pressure may fall only when the heart, the powerhouse of the circulation, is repaired somewhat by rest, digitalis, and diuretics. In fact, if the blood pressure does not now decline, this indicates that the insufficient hypertensive heart is not responding satisfactorily to treatment. In 'low-pressure' failures, on the other hand, a rising blood pressure commonly signifies an improving heart muscle.

HEART SOUND CHANGES IN ACUTE AND IN ORDINARY HEART FAILURE

We shall again take coronary thrombosis as our example of acute heart failure. In *Diseases of the Coronary Arteries and Cardiac Pain,* by Levy, Paul White and others, it is briefly stated that in coronary thrombosis 'the heart sounds are weak and tic-tac or gallop rhythm may be heard'. In *Diseases of the Heart* by Lewis it is still more briefly stated that 'The heart sounds (in coronary thrombosis) are indistinct, gallop rhythm is frequent'. Some expansion of these remarks concerning the heart sound changes in coronary thrombosis may enhance their diagnostic value for the general practitioner.

If the first heart sound is suddenly observed to have become faint and muffled and the second relatively loud in an individual previously known to possess a normal intensity of his first and second heart sounds, then these altered heart sound findings are highly significant of a sudden impairment of the contractility of the heart, *i.e.*, of an acute heart failure, such as coronary thrombosis. Heart sound recordings in coronary thrombosis indicate that the muffling of the first sound is caused by a loss of high frequency vibrations due to either a loss of muscle tone or change in intraventricular pressure, the result of the injury to the heart muscle. However it may be, this faintness and muffling of the first heart sound in coronary thrombosis is best appreciated at the apex where the ventricle abuts on the chest wall. In one's appreciation of the coincident relative loudness of the second heart sound at or to the left of the apex, especially in elderly subjects with possible aortic sclerosis, it is well to recall that the second sound heard in the aforementioned area is mainly the transmitted aortic component of the second heart sound. In all affections of the myocardium the physician should note also the loudness of the first sound at the base, where normally the first heart sound is rather less loud than the second sound. In coronary thrombosis the heart sound alterations observable at the apex are likewise detectable at the base where however the first sound disappears long before it does at the apex. Systemic hypotension weakens the aortic second sound. In the acute heart failure of coronary thrombosis described here the heart sounds at the base are usually inaudible. The obesity of many men and women in Bengal is commonly so gross as to render satisfactory auscultation, even of the relatively normal heart, impossible except for those endowed with really good hearing. In these obese subjects the heart sounds are not infrequently best heard over the xiphisternum, where however one or both sounds may have a peculiar scratch or grunch which must not be confused with pericardial friction. Likewise in emphysema the heart sounds are often best heard over the epigastric angle, where however they may take on a ringing metallic quality from the flatulent stomach so common in these subjects. A special failure of the first sound at the apex as contrasted with that at the xiphoid cartilage together with coincident weakness of the aortic second sound has been reported in some cases of coronary thrombosis. Sometimes in coronary thrombosis the almost complete muffling of the heart sounds everywhere resembles the 'silent heart' one associates with a large pericardial effusion. Overacting heart sounds, on the other hand, occasionally attend coronary thrombosis: in severe cases they herald a further thrombosis or congestive failure: in less severe cases they

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become progressively less demonstrative. Some cases of coronary thrombosis show no detectable heart-sound changes.

Whereas feeble heart sounds are almost the rule in acute heart failure, loud heart sounds may sometimes be heard in chronic or ordinary congestive failure. Most writers have stressed the fact that in the stage of failure, mitral stenosis retains its snappy first sound even when the characteristic murmur has altogether disappeared and that the sounds of the thyrotoxic heart tend to retain their loud and angry character. Few, however, have commented upon the fact that in some cases of congestive failure the sounds become louder with the development of failure and then become fainter when failure recedes or when final circulatory collapse supervenes. The practitioner is naturally nonplussed by these loud heart sound findings in congestive failure because tradition has led him to expect heart sound failure coincidently with heart failure. I have been interested for many years not only in loud heart sounds in certain congestive failures but also in loud gallop rhythm, the extra sound of which is sometimes far from being the soft thud that the tradition-bound might anticipate.

ANGINA PECTORIS

'In this secret and fell disease', remarked Clifford Allbutt, 'there is a fascination to which no physician is a stranger, a fascination in its dramatic events and in the riddle to read'.

'The only established mechanism of cardiac pain', concludes Fishberg, 'is ischæmia of the myocardium—others are purely hypothetical'. In our view, the theory that does not bear the test of practice should be revised or rejected. Thus, Allbutt's aortic theory is at once put out of court by its signal failure to explain the likelihood of sudden death in angina pectoris. This most unpleasant possibility follows angina pectoris like its shadow. In the opinion of Keefner and Resnik, the likelihood of sudden death is indissolubly linked with the underlying mechanism of angina pectoris. In consonance with our conception of the mechanism of angina pectoris the cause of sudden death in this condition is ventricular fibrillation due to sudden myocardial anoxæmia.

Angina pectoris is a chronic recurrent symptom-complex due to paroxysms of localized relative myocardial ischæmia, the result of coronary insufficiency of less than '20 minutes' in duration (usually less than 3 minutes by the clock). It may occur on exertion, on emotion, during rest, or during sleep. Repeated attacks induce replacement fibrosis in myocardial localities afflicted by coronary arteriosclerosis and constantly under-nourished in consequence thereof. Myocardial weakness and congestive failure are the logical sequelæ of such a progressive replacement of myocardial fibres by connective tissue. Angina pectoris, however, inhibits activity. Hence, as a rule, congestive failure does not supervene until after coronary thrombosis has complicated the course of angina pectoris. Indeed, angina pectoris may now altogether disappear as a result of local necrosis of the P-factor producing area. Perhaps more commonly congestive failure and auricular fibrillation limit activity and thus obviate attacks of angina pectoris. On the other hand, the higher oxygen requirements of the dilated heart and the lowered coronary income in failure lead to more frequent seizures of angina pectoris. In the last-mentioned circumstances, the physician should exhibit digitalis (tablets digitalis folia, gr. 1, *b.d., p.c.*, or ℞ tincture digitalis, m. x, aquam chloroformi, ad. ℥ 1, *t.d.s., p.c.*) and not nitrites, for the relief of anginal pain. Digitalis is probably harmful in angina pectoris associated with a small or normal-sized heart.

Certain remarks made years ago by Parkinson and Bedford are much in vogue to-day. Concerning angina pectoris they used to say that 'an individual either has angina pectoris or he has not'. They severely disapproved of 'anginoid pain' and of such misleading and apologetic terms as 'mild angina', 'secondary angina' and 'pseudo-angina' or 'false angina'. They heartily endorsed Potain's dictum that 'there are no false diseases: there are only false diagnoses'. Whenever possible a diagnosis of angina pectoris should include a statement of its ætiology, *e.g.*, coronary arteriosclerosis, hypertensive arteriosclerotic heart disease, aortic insufficiency, syphilitic aortitis with ostial stenosis, calcific aortic stenosis, paroxysmal tachycardia, coronary embolism, arterio-venous fistula, thrombo-angiitis obliterans, periarteritis nodosa and mycotic aneurysms of the coronary vessels, and so forth.

Coronary arteriosclerosis and cardiac hypertrophy usually combine in varying dominance to narrow the coronary reserve. Thus, angina pectoris in the middle-aged and elderly is commonly due to the summation of hypertension and coronary arteriosclerosis: the grade of the latter is usually insufficient in itself to yield angina. Indeed, angina pectoris may be the main complaint of a hypertensive arteriosclerotic heart disease subject until congestive failure or coronary thrombosis supervenes. In the renal hypertension of young persons and of eclamptics, on the other hand, angina pectoris is distinctly rare because coronary arteriosclerosis is absent herein. Hypertensives of both sexes and especially menopausal hypertensive, like rheumatic heart disease sufferers, are remarkably prone to develop cardiac neuroses. It should, however, be borne in mind that cardiac neurosis or neurocirculatory asthenia may overlie and obscure the presence of angina pectoris in the hypertensive arteriosclerotic heart disease subject: evidence of vascular vulnerability elsewhere, *e.g.*, absence of pulsation of the dorsalis pedis arteries, intermittent claudication, retinal arteriosclerosis, peripheral arteriosclerosis, etc., would favour the presence of a complicating angina pectoris in

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such case. A doctor of the last century observed with more cynicism than accuracy that 'the man with arteriosclerosis of his radial arteries has warmed both hands before the fire of life'. Coronary thrombosis is a much more likely accident in coronary arteriosclerosis without hypertension than in hypertensive arteriosclerotic heart disease. Hence the prognosis of the latter is correspondingly more cheerful. The incidence of angina pectoris and of coronary failure in Indians is engaging our attention at the present time. Coronary failure, by the way, is attended by pain and shock as in coronary thrombosis, but is found wanting in respect of permanent electrocardiographic changes and of the evidences of heart muscle necrosis. So far, we have been impressed by the great rarity of angina pectoris in Indians notwithstanding their relatively high incidence of hypertensive arteriosclerotic heart disease and of coronary thrombosis. Incidentally, some writers inaccurately employ the term chronic myocarditis to describe the clinical picture associated with coronary artery disease. Pathologically chronic myocarditis is a chronic but active inflammatory lesion of the myocardium due to bacterial or non-bacterial excitants. As the damage associated with disease of the coronary vessels is due to nutritional changes, the term arteriosclerotic heart disease states what we know and not what we imagine. Angina pectoris is associated with narrowing of one or more of the larger coronary vessels. The senile heart is characterized by extensive or diffuse arteriosclerosis of the finer coronary branches.

'Angina pectoris', states White, 'is a symptom of individuals in the upper walks of life'. We do not subscribe to this notion that angina pectoris is largely a matter of tone, social atmosphere, or something a plain medical writer cannot convey. Just as a history of lightning pains justifies the diagnosis of tabes dorsalis on the history alone, so does a history of effort angina justify the diagnosis of angina pectoris solely in its symptomatology. In general, the pain of angina consists of combinations in varying preponderance of two pain components: it consists of pain transmitted directly and indirectly from the heart. It is notoriously susceptible of misinterpretation by the patient. Its character and distribution may be quite atypical. If, for example, the discomfort begins in the epigastrium after meals, is associated with belching, and is apparently relieved by alkalies, the patient will naturally insist that it is 'indigestion'. In fact, angina pectoris quite frequently does masquerade under the guise of indigestion. If angina pectoris is coincident with some non-cardiac disease, the anginal distress may become hopelessly commingled with and entangled in the symptomatology of the concomitant non-cardiac disorder. Thus, not infrequently the definition and differential diagnosis of angina pectoris may occasion even an experienced physician quite considerable difficulty. In our experience less intelligent patients are often hopelessly incapable of detailing the more complex forms of anginal pain: when called upon to do so they usually grin in an apologetic and speechless manner, utter a few fragmentary human noises and depart with a McLean's powder for their 'indigestion'. Their educational level and discriminating and descriptive powers are totally inadequate for the crucial portrayal of the pain, upon which the diagnosis of angina pectoris is fundamentally based. Little wonder that statistics show that the highest incidence of angina pectoris is amongst the medical profession and the lowest amongst the day-labourer and the farmer. The other factors responsible for this divergent class incidence shall be discussed later.

Libman, Fishberg, White and others have fittingly stressed atypical forms of angina pectoris and the practitioner would do well to bear these forms in mind, especially when dealing with middle-aged patients, labelled 'arthritis of the left shoulder' or 'neuritis of the arms'.

Atypical angina may be encountered in the form of a persistent dull aching pain, in the left more often than in the right shoulder region. The pain is unaffected by exercise or nitrites: it is irresponsive to physical therapy, the form of treatment generally sought by the patient: it is often worse at night and morphine may be required to secure sleep. This shoulder pain is not the usual radiation of the sub-sternal pain to the left shoulder and left arm. It is a continuous and intractable pain that, in our experience as in that of others, may precede or follow angina pectoris or cardiac infarction. We have not found any local radiological changes in these shoulder pain cases. A sub-deltoid bursitis was found in one case by my surgical colleague. But the precise mechanism of this shoulder pain remains obscure.

Spillane and White have recently reviewed a group of patients with eccentrically placed anginal pain, the mechanism of which is likewise obscure. 'A long-recognized example of these larval or fractional forms of angina pectoris', they stated, 'is that in which pain on effort appears only in the arms, the crucial substernal pain being absent'. This eccentric pain of angina pectoris has been described by Herbeden, Osler, Allbutt, and Mackenzie. Retrograde angina or Potain's *angina reuversee* is another eccentric and interesting form of angina pectoris. 'The flow of pain is reversed: it starts in the wrist, elbows or jaw and only settles behind the sternum when fully developed, so that on exertion a patient may complain of pain in the wrist or teeth'—Evan Bedford. In our view, Vaquez's retrograde angina arising in the rectum is a visceral hysteria and in support of this opinion certain remarks of Clifford Allbutt are worth quoting in their entirety: 'What, I repeat, should we think of a lecturer who threw together into the same class and under the same name the functional hemiplegias of

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hysteria and the hemiplegias due to cerebral disease. Surely it is levity to confuse the sequels of unstable "neurotics", mostly women, with the assault of one of the fiercest and most searching afflictions which can fall upon steadfast and resolute men. But the most egregious example of this eccentricity which I have noted is the description, by a well-known modern physician, of a case of "angina pectoris originating in the clitoris"'!

Conversely in gall-bladder disease, pain arising in the gall-bladder may radiate down cardiac pathways sensitized by coronary artery disease.

The up-to-date practitioner readily recognizes the distinctive features of neurocirculatory asthenia, including left mammary pain. In consequence there has been a notable and gratifying decline in the erstwhile popularity of 'angina pectoris'. When, as Harrison has pointed out, angina pectoris, præcordial aching due to the heart consciousness of cardiac neurosis and reflex soreness of the pectoral muscles are present in the same patient there is considerable danger, unless a careful history is taken, that the significant pain may be masked by the two unimportant sensations. Such a case is very briefly presented at the end of this note.

There is an interesting group of cardiac neurotics, exclusively women, of considerable therapeutic importance in that they respond poorly and react badly to the barbituric acid group of hypnotics and sometimes to morphine as well. Alvarez, who first identified these peculiar women in his abdominal practice, well describes them as hypertensive, overactive, markedly fatigued and somewhat psychopathic. Our own impression is that these women 'fight' the barbiturates. In spite of, say, ten grains of medinal at bedtime, patients with this idiosyncrasy truthfully report next morning that they 'hadn't a wink of sleep', or that they had 'snatches of sleep with terrible nightmares'. Chloral is about the only drug that induces satisfactory sleep in these nervy women: ℞ Syrupi chloral and tincturæ valerianæ ammoniatæ, of each ʒss, ammonii bromide, grs. x, aquam chloroformi ad. ʒi. Sig. ʒi secundis horis, ad. doses IV. S.O.S. Passiflorine is their best general sedative: one teaspoonful in glucose water after the midday and evening meal for 20 days.

A classical example of this temperament and idiosyncrasy was lately under our care.

Anglo-Indian lady with 'a long history of nervous heart attacks'. Six weeks prior to admission she had a very bad 'attack' with vomiting which even morphine failed to control: in fact she felt worse after morphine. Medinal and luminal had, she said, 'given her insomnia and left her a bundle of nerves'. Our diagnosis was coronary thrombosis type III six weeks ago; angina pectoris supervened; cardiac neurosis localized to præcordium (to the organ inferiority of Adler and somatic compliance of Freud); reflex soreness of the left pectoral muscles; idiosyncrasy to barbiturates; no discoverable septic foci (septic teeth, tonsils, etc., may underlie cardiac neurosis).

ELECTROCARDIOGRAPHIC INTERPRETATIONS

Thomas Lewis stands at the origin of electrocardiographic interpretation. He stated in the most lucid and conclusive fashion the fundamental principles of clinical electrocardiography. He thought out and made of one piece, solid and permanent the whole system of electrocardiography. As this man of genius has remarked (1937), 'electrocardiography has taken us far, having filled great gaps in our knowledge of these maladies (heart disease), for it is a means of directly examining the all-essential heart muscle'. Unfortunately, however, states Master (1939) 'there has been neglect of the fact that identical changes in the electrocardiogram may result from alterations in the size, shape, and position of the heart, in the absence of any myocardial disease whatever'.

Changes in the electrocardiogram may be due to—

(1) Cardiac arrhythmias,
(2) Muscle damage, acute or chronic,
(3) Alterations in the size, shape, and position of the heart,
(4) The action of certain drugs, notably digitalis, quinidine, and morphine.

An impression lying down at the bottom of my mind for a long time is that many physicians do not appreciate the dependence of the cardiogram upon (3) which include such factors as age, body position, habitus, obesity, pregnancy, hypertension, valvular disease, congenital heart disease, pulmonary disease, and chest deformities, which alter the contour of the heart. Thus, certain electrocardiographic changes are being constantly mis-interpreted as evidence of myocardial damage, as in fact 'toxic myocarditis', 'rheumatic infection' or 'coronary sclerosis', when in reality myocardial disease is altogether absent and the electrocardiographic changes in question merely reflect some alteration in the size, shape, or position of the heart.

An up-country primipara, aged 22 years, in the last trimester of pregnancy was recently referred to me for opinion as to her heart. Her previous history was excellent. Lately, she had become aware of exertional palpitation. Her local doctor discovered 'extra-systoles' and hastily, albeit most carefully, transferred her to an electrocardiographer in Calcutta. Her cardiogram showed left axis deviation, a large Q_3, and an inverted T_3, which, being interpreted, spelled 'coronary sclerosis and toxic myocarditis'. The general condition of the patient was excellent. Radiography confirmed a raised diaphragm with a transverse lie of the heart which was not appreciably enlarged. Her investigation was otherwise negative. Her tracing was regarded as a pregnancy effect, due to the transverse position of her heart. A diagnosis of gestatory heart disease (functional heart disease of pregnancy) was made and no special restrictions were imposed. The lady's pregnancy and puerperium were quite uneventful.

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Gestatory heart disease is a physiological syndrome produced by one or more of the following factors : increased cardiac work as the result of the increased demands of pregnancy, changes in the position of the heart, the arterio-venous fistula-like action of the placenta. Circulatory function commences to return to normal even before delivery. The circulatory peculiarities of the acute phase of beri-beri also bear a striking resemblance to those of arterio-venous aneurysm. Classical examples of 'reversible heart' are encountered in myxœdema, beri-beri, arterio-venous aneurysm, and congenital cavernous hæmangioma.

In neurocirculatory asthenia, rotation of the perfectly healthy though long, narrow, vertical or hanging-drop type heart, produces right axis deviation, large P-waves, low QRS_1, high QRS_2, and QRS_3 and even inversion of T_2 and T_3. Hence the subject of neurocirculatory asthenia who escapes an electrocardiographic misdiagnosis of either 'rheumatic infection' or 'toxic myocarditis' is indeed twice blessed.

We freely acknowledge the fact that acute tonsillar infection and other inflammatory diseases can produce transient electrocardiographic changes such as changes of the conduction time, increase of the duration of the electrical systole, flattening of the T-wave, pictures resembling infarction with negative coronary type T-wave. But we emphatically insist that our electrocardiographic interpretations will become much less lugubrious and infinitely more correct if we correlate certain electrocardiographic changes with radiologically observable changes in the size and shape and position of the heart. 'An appreciation of the dependence of the electrocardiogram on the size, shape, and position of the heart is absolutely fundamental', states Master (1939), 'in the interpretation of the electrocardiogram'. Alterations in the size, shape, and position of the heart, in the absence of any myocardial disease whatsoever, may produce changes in the cardiogram in every respect identical with those found in cases of myocardial damage. Our interpretation of the electrocardiographic changes in aortic stenosis may be recalled. At all events, we shall, perhaps, now understand why some patients that we sent to England with dismal diagnoses, substantiated by 'abnormal' cardiograms, were, to our surprise and possibly embarrassment, reported by the London cardiologist to have exceptionally sound and healthy hearts.

At the National Heart Hospital, Parkinson and Bedford (1928), whose experience in the correlation of electrocardiographic and radiological findings is quite unique, never failed to emphasize the fact that certain electrocardiographic changes may depend entirely on some alteration of the heart size, shape, or position and not at all on the myocardial state which may in fact be remarkably healthy. If these authors

(*Continued at foot of next column*)

DIAMIDINO-STILBENE IN THE TREATMENT OF KALA-AZAR

By L. EVERARD NAPIER, F.R.C.P. (Lond.)
and
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By a process of incomplete experimentation and false deduction, it was concluded that certain guanidine derivatives, by virtue of their hypoglycæmia-producing properties, were capable of destroying the trypanosomes in experimentally infected mice. In attempting to confirm these observations, Lourie and Yorke (1937) found that insulin had no trypanocidal properties *in vitro* or *in vivo*, that *in vivo* one of these hypoglycæmia-producing compounds, namely

(*Continued from previous column*)

cannot afford to neglect such vital correlations, assuredly we cannot presume to do so.

In man there is no correlation between the heart rate and the shape and position of the heart nor between the heart rate and the electrocardiogram. In general, the heart rate is very rapid in small animals (600 p.m. in the mouse, 300 p.m. in the guinea-pig, 250 p.m. in the cat and 125 p.m. in the dog) and slow in large animals (55 p.m. in the horse and 46 p.m. in the elephant).

I am grateful to Lieut.-Colonel J. C. De, I.M.S., Principal of the Medical College and Superintendent of the Medical College Hospitals, Calcutta, for permission to publish this paper.

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synthalin, did not in fact produce hypoglycæmia except when given in doses sufficient to damage the liver, but that *in vitro* it had powerful trypanocidal properties.

This led to an investigation being undertaken under the auspices of the National Institute of Medical Research and the Liverpool School of Tropical Medicine (King, Lourie and Yorke, 1938) demonstrating the trypanocidal properties of a number of allied preparations, and later to another investigation by Dr. A. J. Ewins of Messrs. May and Baker on a series of aromatic compounds of the amidine group; amongst the latter 4 : 4′-diamidino-diphenyl ethylene was prepared.

Yorke (1940) used this preparation in the treatment of one case of kala-azar with apparently good results. The same writer also reported that other workers, including Dr. R. Kirk working in the Sudan, had had good results, but full details were not given.

One of the writers recently had an opportunity to discuss this subject with Dr. Warrington Yorke and at his request undertook to give a more extended trial to this drug in India. Meanwhile, Messrs. May and Baker had sent a generous consignment of 4:4′-diamidino-diphenyl ethylene (diamidino-stilbene, M.&B. 744) to the Director, Calcutta School of Tropical Medicine, for trial; this consignment he very kindly handed over to us.

This paper is a preliminary report on the results of this trial.

The patients.—Seven out of the eight patients who had a full course were Indian male patients in the hospital attached to the Calcutta School of Tropical Medicine. In each case the diagnosis of kala-azar had been made by the finding of leishmania in bone- or spleen-puncture material. The disease was of moderate duration, except in case 7 in which it was apparently of about 6 weeks' duration when treatment was started, and in case 4, in which it was of 18 months or more. Two other patients were attending the kala-azar out-patient clinic; one had a full course of eight injections and one ceased to attend after five injections, given on alternate days.

The dosage.—In our choice of dosage, we were guided by the clinical experience with this drug quoted by Dr. Warrington Yorke and by our own general experience that it is better to give as near as possible to the maximum tolerated dose at first, in order to ensure the maximum effect of the drug and establish its specificity (or the reverse, in which case it can be discarded immediately), and subsequently, if possible, to reduce the dosage, in order to find out the minimum effective dose, rather than to start too cautiously and in the event of failure to be uncertain if it is the drug or the dosage that is at fault. We therefore gave initial intravenous doses equivalent to 0.001 gramme per kilo body-weight. Though this dose was usually tolerated without adverse symptoms, the patients became flushed, had a burning sensation all over the chest and abdomen, and slight dyspnœa, but these sensations passed off fairly rapidly. In a few instances the ill-effects were more disturbing (*vide infra*). We then increased this dosage slowly, usually by 0.01 g. (actual), up to 0.002 g. per kilo body-weight, but, as weights in our hospital are recorded in pounds, we subsequently first settled the maximum dose to be aimed at in each case, on the basis of 0.001 g. per pound weight, and then gave an initial dose of 0.050 g. (actual), if this was not more than two-thirds of the maximum dose, and increased the dose by 0.010 g. (actual) up to the maximum dose. We gave 8, 10, or 12 daily injections.

Ill-effects.—It is of interest that most of the ill-effects occurred in the first few cases treated and early in the treatment. Equivalent initial doses did not affect the subsequent patients, nor after tolerance had been established did subsequent larger doses in the same patient cause a repetition of the ill-effects.

The ill-effects amount to a marked exaggeration of the flushing and burning sensation mentioned above. One old woman with an oriental sore who was given a relatively very small dose (about 0.00025 g. per pound) became pulseless for some minutes, a second with kala-azar had severe burning and vomited, and future treatment was abandoned in both cases. A number of patients had rigors—these are noted on the charts. The symptoms were relieved almost immediately by adrenalin and in one patient, who had vomited on each occasion, a prophylactic dose of 0.125 c.cm. of adrenalin before the injection seemed to prevent the vomiting.

It was probably a coincidence that two patients developed pneumonia, one definite lobar pneumonia and the other, a child, broncho-pneumonia, during, in one case, and, in the other, immediately after, the course of treatment. In both cases, M.&B. 693 was given and the condition cleared up in the usual way. Both of these patients had unusually high leucocyte counts, and the former had lung symptoms from admission.

One patient developed acute congestion of the conjunctivæ in both eyes with marked photophobia after the eighth and ninth injections; another injection was given, but the condition was not exaggerated. The eyes were normal again within a few days. No cause could be attributed, by the ophthalmologist, except an error of refraction; the fundus was normal.

In no instance did the treatment produce any psychological changes, nor did our patients exhibit the deplorable degree of moral turpitude reported by Dr. Kirk (Yorke, *loc. cit.*).

Progress.—It was unfortunate that many of the cases were in an afebrile phase when treatment was started. In cases 2 and 6, the temperature came down about the middle of the course of treatment. On the other hand, in other cases (*vide* chart, case 7) there was a distinct

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reactionary rise and the temperature was maintained at a high level until the course was finished.

In all but the diabetes case the weight improved, in some considerably. Except in case 4 the spleen was markedly reduced and disappeared under the ribs so that at the time of discharge it could not be felt or could only be felt on deep inspiration. In case 4, there was little or no reduction after the first course, but after the second, it was more mobile and only about 3½ inches (originally 7 inches) below the costal margin.

The blood picture improved quite remarkably in every case; the red cell count and hæmoglobin showed a sharp rise despite the fact that no tonic or hæmatinic drug was given, and the leucocyte count was 8,000 or more in every case but two at the time of discharge.

Proof of cure.—This has always been a difficult problem. We have found (Napier, 1937) that immediately after the completion of an efficient course of neostibosan viable parasites could still be demonstrated in the spleen, but that in the course of a week or so they disappeared spontaneously, *i.e.*, without further specific treatment; on the other hand, even when cultural methods have failed to show their presence, the patient has sometimes relapsed. Time alone is the test. However, some indication can be obtained from sternum puncture after a short interval and we did this in five of the eight patients; in one case parasites were still present 11 days after the last injection, and there is some reason to believe that this patient was not cured. In the other four cases, no parasites were found and it is believed that they were cured.

Data of the eight cases of kala-azar that had a full course are given in the table and temperature charts. A few further notes on each case are given below :—

Case 1.—Afebrile; abdomen distended and liver enlarged and tender. Spleen puncture was difficult on account of the distension and little material was obtained. Tibia puncture was done with a Salah needle and a good result obtained.

Reaction.—Flushing of the face only.

A few days after the last injection of M.&B. 744 was given the child developed pneumonia; this responded well to M.&B. 693 and the temperature was normal in 5 days; resolution followed, but the child's weight fell to 23 pounds. Subsequently he improved steadily.

Case 2.—A diabetic, incidentally the only case in our 20 years' experience at the School in which the two diseases have been seen in the same individual. His fever was of a high continuous type suggesting enteric.

Reactions.—Flushing of the face, burning sensation all over the trunk, dyspnœa, and slow and almost imperceptible pulse. Rigors after 0.050 and 0.060, but later tolerated 0.080 g.

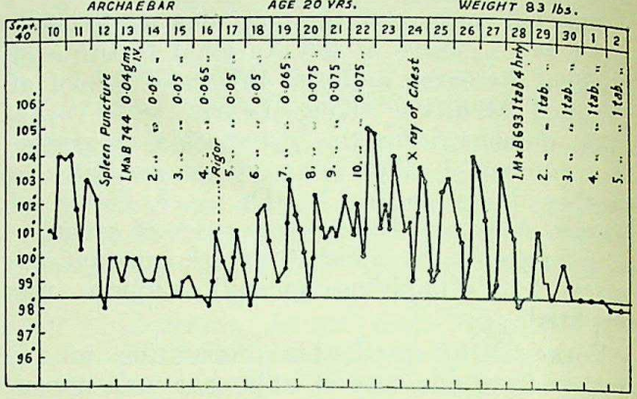
Insulin was not given during the treatment by M.&B. 744 and his blood sugar rose considerably.

Temperature fell after the second injection, but rose occasionally to 99.5°F., and was finally normal after the course was finished. He was a difficult patient and left hospital a week later.

Case 3.—Admitted with high fever, lung symptoms but without definite signs, and a slight leucocytosis.

Reactions.—Rigor after 0.065 g.

Temperature fell on the third day, but rose again and definite signs and symptoms of lobar pneumonia were noted on the 12th day. M.&B. 693, six tablets a day for 5 days brought the temperature down to



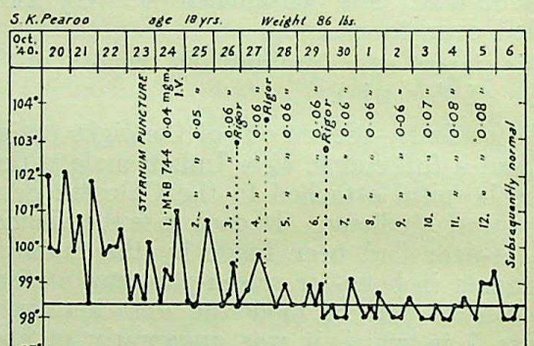
Case 3.

normal again (*see* chart). He improved rapidly but insisted on leaving the hospital.

Case 4.—A 'chronic' type of case; long duration, large hard spleen, and moderate intermittent fever.

Reactions.—Flushing, burning sensation, and rigors for the first few injections, later none.

Temperature fell to normal during the first course, but the spleen remained large and firm. Spleen puncture 11 days after the last injection showed leishmania still present but scanty. No fever during or after the second course; spleen still large, but softer and movable. His Wassermann reaction was positive at the time of admission.



Case 6.

Case 5.—Almost afebrile with respiratory symptoms but no physical signs.

Reactions.—Slight febrile reaction (100°F.) after first injection (0.05 g.), with flushing, burning sensation over abdomen, etc. No reaction after fifth injection (0.09 g.).

Temperature settled again to normal and remained so throughout.

Case 6.—A febrile case, moderately high remittent.

Reactions.—Rigors after 0.060 but later tolerated 0.080, also flushing and burning sensation.

Temperature came down during the course, but was not finally normal until the injections were discontinued (*see* chart).

Case 7.—Admitted on the 14th day of fever of a high continuous type with clinical diagnosis of typhoid. The Widal was negative and the extremely low leucocyte count suggested kala-azar, but no parasites were found in the sternum-puncture material. Meanwhile, the temperature fell to normal, but the spleen showed signs of enlargement and after a month became puncturable, *i.e.*, came down well below the costal margin. Leishmania were found.

Reactions.—Moderately severe when the higher doses were reached. His face became flushed, burning of the

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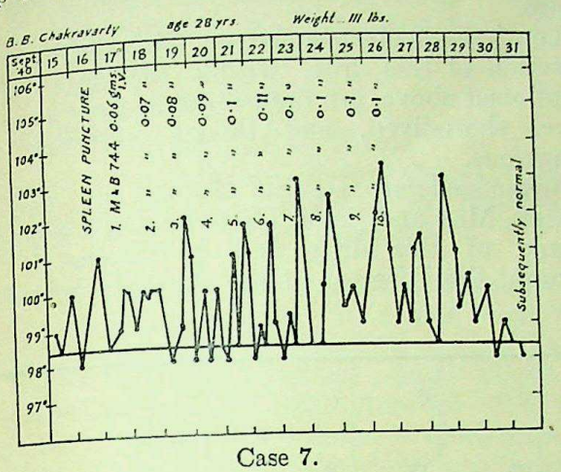
body, severe headache, injection of the conjunctiva and photophobia which lasted for a few days. He had a sharp febrile reaction after each injection (*see* chart).



Case 7.

Case 8.—Treated as an out-patient; injections given three times a week.

Reactions.—Fairly severe reaction after the first dose of 0.014 g., subsequently no more reactions until the last dose of 0.020 g.

He was brought to the hospital for a week or so after the last injection and was considered to be cured by his guardians; his spleen was not palpable.

Other cases.—Three other out-door patients were treated—two cases of kala-azar and one a case of oriental sore. One boy received only seven injections and did not appear again. The other two were women and both had alarming symptoms after the first dose (*v. s.*) and on this account we decided not to undertake treatment amongst out-door patients, until we had had more experience with the drug. One patient, a boy aged 10 years, weight 61 pounds, with post kala-azar dermal leishmaniasis is still under treatment : up to the present he has received 20 daily injections totalling 0.950 g., maximum individual dose 0.060 g. (not well-tolerated). There is evidence of distinct improvement in the local lesions; under similar conditions treatment with an antimony preparation would not have produced any dramatic result.

Discussion.—We must emphasize the essentially preliminary nature of this report and in view of its incompleteness it is perhaps necessary to justify its publication.

Since antimony preparations were first used in the treatment of leishmaniasis in 1913, a very large number—the figure probably running into thousands—of antimony compounds have been prepared, some hundreds have been tested, and of these some dozens have been found to be efficacious; other drugs, which contained no antimony molecule, especially those which have proved useful in trypanosomiasis, *e.g.*, Bayer 205, and tryparsamide, and the all-conquering sulphonamides, have been tested in kala-azar, but up to the beginning of this year no drug that did not contain antimony has been proved to have any specific action in this disease, though from time to time hopes have been raised by apparent cures in one or two cases, or from the reports of inexperienced workers. The finding, therefore, of a non-antimonial preparation that is effective in kala-azar is a matter, firstly, of considerable academic importance, and, secondly, one that may have far-reaching practical repercussions, for many obvious reasons of which not the least is that at the present moment the best antimony preparations are not available in the quantities in which they are required; therefore any claim to such a finding certainly demands confirmation.

Some of the difficulties of the clinical testing of anti-kala-azar drugs have been referred to above and have been discussed elsewhere by the senior writer (Napier, *loc. cit.*). The proper assessment of the relative efficacy of any drug necessitates a very extended trial—this writer's first report on neostibosan included 61 cases and his subsequent report 254. Though such an extended trial as this may not be warranted in this instance, it will in any case probably be a year or so before sufficient data have been collected to answer the many questions that arise, and therefore the expression of an interim impression seems to be called for.

The senior writer has, during the last 20 years, tested clinically in the treatment of kala-azar, under controlled conditions, in some thousands of cases, a very large number of preparations; of these many have been discarded and others have been selected and have taken their places in the pharmacopœias. He therefore feels that he is qualified, not only to carry out such an investigation on the comparative therapeutic value of this drug, but to express a tentative opinion on the drug before the stage where its full value, as compared with that of other drugs, has been accurately and scientifically assessed.

Some of the questions that must be answered

Very many questions remain to be answered, of which we mention a few.

The clinical progress in seven out of the eight cases who underwent a full course was extremely satisfactory and, from previous experience, we should expect most of them to be cured; the negative sternum-puncture findings add support to this expectation, but do not prove that cure has been effected. Time alone will show.

The dosage that we have been giving sometimes produces alarming symptoms, so that one could not advocate it, except under hospital conditions, and even under these one might encounter a hypersensitive patient in whom even more serious symptoms occurred. On the one hand, it is possible that we can find some means of obviating these symptoms, or, on the other, it may be necessary to adopt a lower standard of dosage. The former possibility is indicated by the fact that reactions have not been so severe or frequent recently as they were at first, and that in one or two cases a dose of adrenalin preceding the drug seemed to control the reactions.

Clinical experience with the drug has been so limited up to the present that its potentialities

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in the way of the production of adverse sequelæ have not been really tested.

There are other reasons, unconnected with ill-effects and sequelæ, for wishing to reduce the dosage; it is possible that smaller individual doses and/or a shorter course of injections may be equally efficacious. The courses given in the cases reported were chosen arbitrarily, and, though one patient appears not to have been cured, this patient may have been a particularly 'resistant' case and a shorter course may prove sufficient to effect a cure in a high percentage of cases.

Though the drug may be no more effective in the ordinary case than the best antimonials, yet it may prove effective in 'resistant' cases; if so, it will play an important rôle in the treatment of kala-azar.

Tentative conclusions

The clinical and laboratory evidence in this trial suggests that 4 : 4′-diamidino-diphenyl ethylene (diamidino-stilbene) is an effective therapeutic agent in the treatment of kala-azar.

A cure can be effected with a total dose of less than 1.0 g. per 100 pounds body-weight, the mean relative total dose in the seven successfully treated cases was 0.795 g. per 100 pounds.

In an adult an individual dose of 0.0005 g. per pound body-weight is usually tolerated without unpleasant bye-effects and tolerance to a dose of 0.001 can usually be acquired by a gradual increase of the dosage from the smaller figure.

The bye-effects associated with intravenous injection of this drug, within the dose limits mentioned above, are immediate in their appearance, short-lived, and though alarming not dangerous.

Acknowledgments.—Our thanks are due to Messrs. May and Baker for providing a generous supply of this drug and to Colonel R. N. Chopra, the Director of the Calcutta School of Tropical Medicine, for handing over this supply to us, and for providing us with the facilities for testing it.

TABLE

Serial number	1	2	3	4	5	6	7	8	
Age, in years	3	25	20	18	25	18	28	6	
Weight in pounds	24	94/81	83	103/101	85	86	106/111	28	Second weight is before treatment.
Duration in months	4	(12)	2½	18	(2)	(3)	½/1½	(24)	Brackets indicate history questionable.
Spleen, inches below costal margin.	2	p	3	7	3	3½	p/2½	5½	
Aldehyde reaction	+	— ive	+	+++	+	+++	— ive	+++	
Hæmoglobin, grammes per 100 c.cm.	8.2	11.0	6.32	8.5	(11.0)	9.35	10.2	9.7	Brackets indicate counts during treatment.
Leucocytes per c.mm.	13,300	1,200	10,050	1,700	(5,800)	2,950	1,800	3,350	
Diagnostic puncture—									
spleen	0	..	+	+	..	..	0	..	+ indicates leishmania.
sternum	..	+	..	+	+	+	+	..	0 indicates no leishmania.
tibia	+	..	..	..	..	..	..	..	
Treatment.									
Total dose M.&B. 744, grammes.	0.181	0.770	0.59	0.850 + 0.915	0.810	0.740	0.910	0.126	
Total dose per 100 pounds body-weight, g.	0.754	0.950	0.711	0.825 + 0.866	0.931	0.860	0.821	0.450	
Maximum individual dose, g.	0.025	0.080	0.075	0.100	0.100	0.080	0.110	0.020	
Number of doses	10	12	10	12 + 10	10	12	10	8	
Reactions, slight	+	..	..	+	+	..	..	+	
„ severe	..	+	+	..	..	+	+	..	
Final sternum puncture	0	..	..	+* 0*	0	0	0	..	* spleen puncture.
Number of days after last injection.	60	..	..	11	18	33	30	..	
Final hæmoglobin, g.	10.7	9.6	9.76	12.37	14.02	13.7	..	..	
„ leucocyte, per c.mm.	10,100	5,300	9,900	3,700	8,150	8,100	6,925	..	
„ spleen, inches	0	0	0	3	0	0	0	0	
„ weight, lb.	31¼	81	90	.. 118	96	93	122	..	
Apparent result	cured	cured	cured	not cured †	cured	cured	cured	cured	† later cured.

[*Later note.*—Case 4 has now gained 17 lb. and shows every evidence of being cured.

A second patient with oriental sore received a dose of 0.05 gramme (= 0.0003 gramme, per lb.); he became unconscious with loss of reflexes, though a child with kala-azar had a relatively larger dose from the same ampoule and had no ill-effects. One of the women referred to above became unconscious; she also had oriental sore. The local lesion appeared to be much better after the single injection in both cases.

It may be a coincidence that both patients who became unconscious were not cases of kala-azar, but we have observed in the past that non-kala-azar patients are usually more sensitive to antimony injections; we noted this especially in the early days when sodium antimony tartrate was the treatment.]

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INTESTINAL POLYPOSIS

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THE polypoid growth of the intestine is a rare and interesting condition. In recent years this pathological condition of the bowel, specially of the large one, has attracted much attention. Lockhart-Mummery (1935) observed that the ætiology of malignancy cannot be elucidated by the histological study of fully-developed tumours and that it was necessary to go further back and study the changes that occur in the epithelial cells before this stage of malignancy was reached. Adenomata of the mucous membrane of the large intestine are peculiarly liable to undergo malignant change and therefore such conditions are particularly suitable for study from the point of view of the precancerous stage to the malignant change. Important observations on the influence of heredity on tumour formation has been made from the study of the rare disease, multiple polyposis of the intestine; multiple adenomata of the large intestine has a distinct familial tendency and is a true mendelian dominant (Lockhart-Mummery and Dukes, 1928).

In consideration of the above we have described herewith a few cases of polyposis of the large and small intestines that we were able to study.

Case 1.—Male, aged 26, land-holder by occupation, was admitted on 6th April, 1939, for passing blood and mucus with loose motions for the last six months.

History of the illness.—About six months before, he suddenly began to pass blood and mucus with the fæces. At first he used to pass three or four such motions a day which gradually increased to about twenty when he came to the hospital.

On examination, the patient was found to be a well built but emaciated man. There was œdema of the extremities and face; no glandular enlargement could be seen. Temperature—98°F. P/R = 100/24. The tongue was coated, moist and the epithelium was found to be deficient. The abdomen was slightly distended, and there was tympanitis and generalized rigidity. Pain was felt all over the abdomen. The descending colon was felt to be cord-like and it was markedly tender. On rectal examination, 1½ inches from the anal opening a hard marble-like structure was felt. The liver was enlarged and tender; there was bilateral emphysema of the chest. Stool examination showed mucus, blood and many pus cells; a few hookworm ova were present. Repeated cultural examination showed no significant findings.

Blood examination report: Hæmoglobin—40 per cent, red cells—2,030,000 per c.mm., leucocytes—9,375 per c.mm., polymorphonuclears—70 per cent, lymphocytes—22 per cent, mononuclears—2 per cent, Halometric index—4.6.

The patient showed no improvement in the hospital, gradually became exhausted, and died on 22nd April. Before death surgical emphysema was noticed over the neck, chest wall and upper extremities. The body was sent up for post-mortem examination with a diagnosis of chronic bacillary dysentery. The autopsy examination showed the following:—

Surgical emphysema was present and extended from the upper part of the neck down to the lumbar region; the emphysema also extended up to the wrists of both the hands. Mesenteric lymph nodes were conspicuously enlarged. Both the lungs showed broncho-pneumonic changes; the liver was pale and fatty. There was no other gross abnormality except in the intestine. The large intestine was thick, hard and presented an appearance of a hose-pipe. On cutting it open, the intestine was seen to be about half an inch thick and blood-stained mucoid material was seen within the lumen of the large gut which was uniform in appearance. On pressing the inner wall of the intestine with finger considerable resistance was felt and it was seen that the thickness was due to a mucoid material which could not be easily removed. The intestine was then carefully washed and a remarkable picture was seen (figure 1). From the ileo-colic junction to the anal canal innumerable polypoid growths were seen to project from the intestinal wall completely hiding it. The polypoid growths were of different sizes; the largest ones measured about ¾ inch in length and ½ inch in diameter at the distal end. These were fusiform in shape and were joined with the wall of intestine with a thin slender stalk. The smallest ones were little bigger than pin heads. At the junction of the upper two-thirds with the lower one-third there was an area which consisted mainly of the small polyps (figure 1).

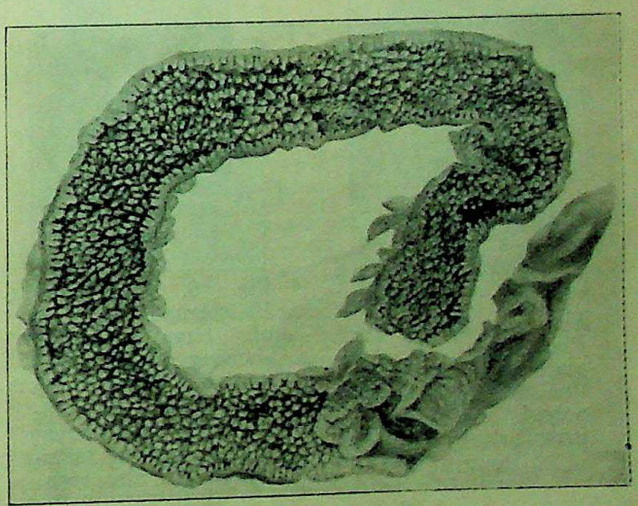

Fig. 1. Case 1.—Photograph (reduced size) of the large intestine as seen after cutting it open. The innumerable polypoid growths have occupied practically the whole of the mucous surface of the intestine. Very little normal mucous membrane could be seen between them.

(*Continued from previous page*)

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Some of the bigger polyps contained a small amount of clear watery fluid which when expressed made these look quite flat. Histological examination showed the following:—

The papillomatous processes were obviously arising as proliferations of the Lieberkühn's glands which composed these polypoid masses (plate XXI, figure 2). Plate XX, figure 3, is a camera-lucida drawing of the section through a number of polyps with the whole of the thickness of the intestinal wall, and plate XX, figure 4, a single polyp of the bigger variety. These were seen to extend directly from the muscular coat. The submucosa was very scanty throughout the intestine and at places where the papillary projections appeared the submucosa was entirely absent (plate XXI, figure 2, and plate XX, figures 3 and 4). It seems probable that while the glandular proliferation extended into the lumen they also encroached on the deeper layers, thus causing the obliteration of the submucosa. The adenomatous character of these polypi are well seen in figure 2. No familial history could be traced.

Case 2.—Aged 30, was admitted into the hospital on 7th July, 1925, with the following:—

Constipation for eight days; no flatus was passed for five days; fæcal vomiting for one day. On examination, the abdomen was found to be soft but tympanitic; temperature 98.6°F. P/R = 100/36. Tongue was dry and he looked extremely toxæmic. High tube enema produced no result, nor did the compound enema yield anything. Stomach wash was given which showed the content to be fæcal in nature. A laparotomy was performed and an intussusception was found in the small intestine about a foot from the ileo-colic valve. It was felt that a foreign body caused the obstruction which on examination was shown to be a polypoid tumour mass which was responsible for the intussusception. About two feet of the gut were resected with the polypoid growth. The patient expired six hours after the operation. The resected gut on examination was found to contain two polypoid growths which were situated about a foot apart from each other (figure 5). The topmost one was larger and was 1½ inches by 1 inch in size. The mass was separated into four divisions by means of three fissures within it. The growth was found to arise from the intestinal mucosa by a small elongated stalk. The lower growth was about half the size of the upper one and was nodular in appearance. Several blocks were made from different portions of both the tumour masses and the following were made out:—

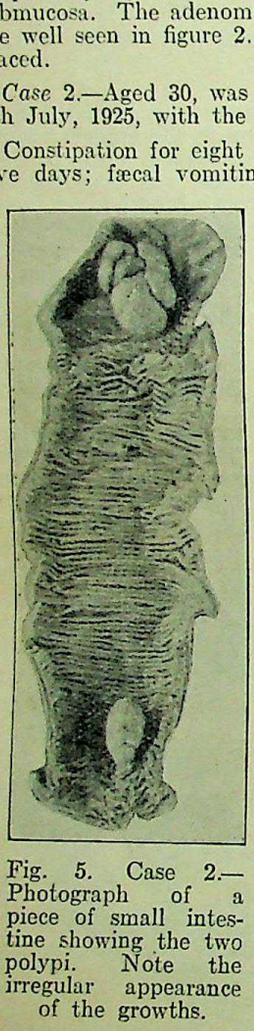

Fig. 5. Case 2.—Photograph of a piece of small intestine showing the two polypi. Note the irregular appearance of the growths.

Fig. 9. Case 3.—Photograph of a piece of large intestine showing one polypoid growth with the slender stalk. A number of elevated areas in the mucous membrane are also seen.

The tumours were composed of different types of structural patterns at different places. At certain places the mass was composed of tissue which was simply adenomatous in nature (plate XXI, figure 6). There was glandular hyperplasia, showing no malignant change. This sort of picture was predominantly present at the area from where the stalk of the polypi originated. plate XXI, figure 7, shows another type of composition of the tissue which consisted of normal glandular structure with a few glands showing atypical proliferation. In the deeper portion of the growth the tumour showed marked atypical proliferation of the glands which were evidently taking a malignant turn (plate XXII, figure 8).

Case 3.—Aged 12, was admitted into the hospital on 16th March, 1939, with a history of continuous fever for nine days. On examination the patient was found to be toxæmic and after four days' stay in the hospital he died of toxæmia and circulatory failure. The body was sent for post-mortem examination with a diagnosis of enteric fever. The autopsy examination showed a much enlarged spleen, weighing 920 grammes, and a number of ulcerated areas in the jejunum and ileum. The character of these ulcers was like that of enteric ones. The large intestine, at the sigmoid part, showed a number of polyps. Besides these there were areas in the large intestine which showed slight nodular elevation in the mucous membrane (figure 9). Some of these areas looked just as prominences from the mucous surface, others presented distinct elevations. Histological sections from different portions of the elevated areas and the polypoid growths showed the following:—

The elevated areas showed slight adenomatous change in the simple tubular glands of the mucous membrane (plate XXII, figure 10). The definite polypoid growths on section showed very marked hyperplasia (plate XXII, figure 11) and sections from the deeper portions of the tumours showed frankly precancerous condition (plate XXII, figure 12).

Comments and discussion

Multiple adenomata and malignant adenomata of the large intestine are two different pathological entities. Lockhart-Mummery (1935) has pointed out the difficulty of accepting such clear-cut divisions to differentiate between the two types and he has suggested the name adenomatosis, where numerous small polypoid growths occupied practically the whole of the large gut. This extremely rare disease has also been described as multiple adenomata and colitis polyposa. The condition has distinct familial predisposition. Our case 1 is an instance of such a condition; although the family history was not available the picture (figure 1) is a typical one. The patient had the first symptoms about six months before his death. It can be assumed that the lesion might have started earlier, yet the extensive nature of the involvement and the uncountable number of polyps clearly show the extreme rapidity with which the disease progressed. The histological picture of the individual growths did not suggest any malignant change (plate XXI, figure 2). We studied histological characters of the polyps of all the

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sizes, but the nature of the growth was essentially the same everywhere, *viz*, simple adenoma. In the bigger polyps the growth varied only in quantity. It could be seen that the polypoid growth was sharply limited by the muscular layer (plate XX, figures 3 and 4), the submucosa being almost completely encroached by the growth. Although the individual growths were benign in nature histologically, the sum total effect of all these produced results which were far more injurious than that can be caused by simple irritation. The collection of mucus and cellular exudate and the fæcal matter in between the different polyps gave the intestine a rigid structure and the finding at the rectal examination thus could be easily explained. Cases 2 and 3 are of course quite different in nature from case 1. Case 2 showed adenomatous polypi in the small intestine and case 3 in the large intestine. By studying a number of blocks from different parts of the tumours in both these cases, the transition from simple glandular hyperplasia to atypical proliferation could be made out. Plate XXI, figure 6, and plate XXII, figure 10, show a simple adenomatous condition. From this simple adenomatous condition a number of glands lying side by side with normal ones are clearly seen to assume an atypical nature (plate XXI, figure 7, and plate XXII, figure 11). This clearly shows the malignant tendency of these glandular structures. At other areas the normal appearance of the gland have almost disappeared (plate XXII, figure 8, and plate XXII, figure 12) assuming an appearance of malignancy. The question naturally arises whether these cells which are taking a malignant turn are simply transitions from normal structures or whether these particular cellular elements were endowed with a genetic capacity for malignant proliferation which was dormant but suddenly let loose later ? This naturally takes us to the various theories as to the mode of production of new growths.

Summary

Three cases of intestinal polypoid condition are described, of which two cases occurred in the large bowel and one in the small intestine. One case was found to be a condition of multiple adenomatosis, a very rare condition, and two cases showed the pictures of simple adenoma of the mucous membrane showing malignant change.

In conclusion, our thanks are due to the Superintendent, Medical College Hospitals, Calcutta, for the case records and to the members of the staff of this department for the help rendered.

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ECTOPIC PREGNANCY

(A CLINICAL NOTE)

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SINCE Albucasis in the eleventh century first described extra-uterine pregnancy, a great deal of literature has accumulated on this subject. Nature has so arranged matters that the embryo of the human race is from an early date accommodated in and fed from the uterus. It would therefore seem reasonable to suppose that its conception should also take place there. However, this appears not to be the case; probably on account of the difficulty of transport for the delicate ovum. It is now established, practically beyond all doubt, that the human ovum is normally impregnated within the lumen of one of the fallopian tubes most usually at the fimbriated end.

Ovulation takes place about the 14th day of the menstrual cycle, counting the 1st day of the period as the 1st day of the cycle. The ovum, still surrounded by its zona pellucida, is extruded through the rupture of the graafian follicle and lies free near the surface of the ovary. The latter is in close apposition to the fimbriated end of the fallopian tube which attracts the ovum towards its open ostium. (The exact method of the entrance of the ovum into the tube is still unknown.) When the ovum enters the abdominal ostium of the tube, it is probable that the latter closes and is sealed by the enfolding action of the fimbriæ. The ovum is now ready for impregnation, but, if this does not occur in 2 days, it dies, the corpus luteum undergoes necrosis, and the phenomenon of menstruation results.

If however the ovum is destined for impregnation, the procedure is as follows :—

The seminal fluid on ejaculation is deposited in the neighbourhood of the external os of the cervix uteri, and in the posterior vaginal fornix. At once the sperms begin to make their way through the cervical canal, and the uterine cavity, into the tube, and finally one fuses with the ovum usually in this fimbriated end. From all accumulated evidence it appears that only those sperms deposited in or around the external os are available for impregnation, and that the 'vaginal pool' (Adair, 1940) in the posterior vaginal fornix is merely excess. Sperms which are deposited in this pool are very short-lived owing to the acidity of the vaginal secretions which is inimical to them. Indeed sperms acted upon by the normal acid vaginal secretion may lose their motility in less than half an hour. Very rarely the ovum is impregnated in the ovary in the graafian follicle, giving rise to an ovarian gestation, only some 40 genuine cases of which have been reported up to 1927 (Eden and Lockyer, 1935).

Impregnation in the abdominal cavity has never been authentically reported though it has

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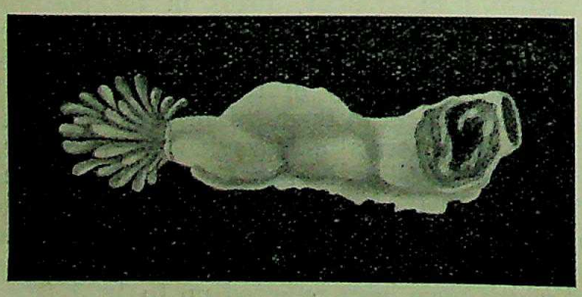
been suggested. It is estimated that the sperms travel at such a pace that fertilization takes place within a few hours of coitus. Therefore coitus during the 10th to 15th day of the menstrual cycle is the most likely period in which to effect impregnation, *i.e.*, the 'dangerous period'. This is a much truer dictum than that of the opposite end of the cycle, *i.e.*, the so-called 'safe period'.

Normally, on fusion with the sperm, the impregnated ovum makes its way through the tube into the uterus and becomes embedded in the engorged endometrium which has been got ready for it. Therefore, it stands to reason that any factor which causes delay in this migration will favour the continuance of the pregnancy at the spot where the delay occurs, for the sperm being much smaller than the ovum can pass through a narrower lumen, and consequently any inflammation, kinks or adhesions which cause a partial stenosis of the tube may prevent the passage of the ovum. Some authorities state that, as long as the zona pellucida remains intact, the embedding of the ovum in the tube cannot take place. Therefore, anything which gives rise to premature shedding of this membrane favours a tubal pregnancy. The tube, being composed of tissue very different to that of the uterus, cannot dilate to accommodate a pregnancy of more than a few weeks, so that the onset of symptoms occur which, if neglected, may lead to rupture of the tube from over-dilatation. Rupture may also be caused by the eroding action of the trophoblast which is much more serious in the tube than in the uterus.

The fimbriated end of the tube is more dilatable than the uterine end, so that symptoms, or rupture, are more likely to occur early if the pregnancy is situated at the isthmus. Rupture of the tube in tubal gestation of the ampulla usually does not occur until towards the end of the second month, whereas it may take place in the first 2 or 3 weeks if the gestation is in the isthmial portion. This is an important point and is one which calls for accurate diagnosis of the situation of the pregnancy, on account of the urgency in undertaking operative interference at an early date.

The following case history is an example :—

Age 24, married 13 years: one child, seven years old. The patient was admitted at 12 noon on 19th July,



1939, as an acute emergency. The following history was available. Severe pain in the lower abdomen, and

(*Continued at foot of next column*)

PROLAPSE OF THE RECTUM IN CHILDREN AND THE ROLE PLAYED BY GALLOWS SPLINT IN THE CURE OF THIS CONDITION

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PROLAPSE of the rectum is common both among adults and children. Among adults it is common after the 4th decade and in children between the ages of 2 and 4. Males were more commonly affected than females, and among children the ratio of male to female children was 9 : 1 in a total of ten cases treated so far. In none of the cases of prolapse of rectum among old people, could they give a history of prolapse in early life, as is stated in the textbooks. It is possible that the class of people who were suffering from this disease could hardly remember their past history and the question is still an open one. In children, however, it is common owing to bad hygiene, dietetic errors, and gastro-intestinal infections. The prolapse in children may be complete or partial. In cases of partial prolapse, polypus is often the cause of this condition and these cases are brought to the hospital with a history of bleeding before,

(*Continued from previous column*)

some slight vaginal bleeding for last five days. Periods had been quite normal and regular, the last one about a month ago. The patient stated she was expecting her next period at any moment. Early that morning the patient suddenly got worse, so she was brought to hospital.

On examination.—She was pulseless, blanched, and collapsed. The abdomen was tense and swollen. The case was obviously one of intra-abdominal bleeding, probably from a ruptured ectopic. The patient was brought to the operating theatre at once and the abdomen opened. On incising the peritoneum free blood was seen in such quantity and under such tension that it spouted up into the air. As much as possible of this, about 16 ounces, was caught in a sterile bowl in which was a solution of sodium citrate, and this was given to the patient as an intravenous auto-transfusion during the operation. At first it was not clear where the bleeding was coming from, as no tumour could be felt, and the fimbriated ends of both fallopian tubes were seen. A rapid inspection of the spleen and other organs did not reveal any injury, so the blood was then swabbed out of the cavity with great rapidity when the small rupture at the isthmial end of the right tube was apparent (*vide* illustration). The bleeding was coming from a spouting vessel at the medial aspect of the rupture. The tube was removed in the ordinary way and the patient made an uneventful recovery.

My thanks are due to Dr. B. P. Tribedi, the Professor of Pathology in the Medical College, for the drawing of the specimen.

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during, or after the motion. Sometimes the bleeding is of an alarming character, and frequent hæmorrhages cause anæmia and debility. In these cases removal of polypus cures the prolapse and improves the general condition of the patient. In cases of complete prolapse the mothers of the children generally seek admission with a history of dysentery or diarrhœa. On admission, the children are found to be emaciated with a complete prolapse, this in some cases being irreducible with marked œdema (figure 1). The problem of treating these

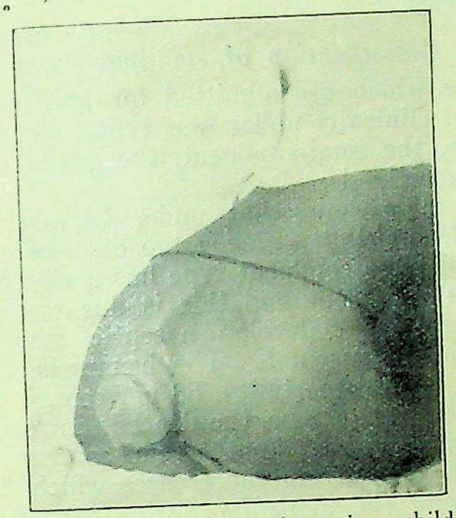

Fig. 1.—Complete prolapse in a child with œdema causing irreducibility.

children as out-patients is difficult, because the home condition of the majority of the people who seek advice is very poor. It is therefore necessary to hospitalize these cases.

The whole principle of treatment of this prolapse is :—

(1) to reduce the prolapse and maintain it reduced,
(2) to attend to the dietetic errors, and
(3) to treat the infective condition of the intestinal tract which preceded the prolapse.

The reduction of prolapse in the majority of the cases is easy, but maintenance is difficult. The mode of evacuation either by sitting on a commode or in the usual way the Indian children defæcate is inimical to the cure of this condition. The following scheme has given satisfactory results :—

(1) Both legs are slung up in a gallows splint, as in treating a fracture of the femur, so that the buttocks are slightly raised from the bed and the glutei strapped (figure 2).
(2) The motion is examined for amœbæ and other infections, and, if present, treatment is given for this infection.
(3) Diet is regulated and deficiency of vitamins supplied.

It is important that the child should have the motion lying in bed. This is the essential part of the treatment and this object is gained by using the gallows splint. The use of this splint perforce prevents the child from getting up and provides the rest that is so necessary for the children who are debilitated. To facilitate an easy soft motion, the child is given liquid paraffin at night and a paraffin enema of 2 to 3 ounces through a rubber catheter high up in the rectum in the morning. With this simple treatment the prolapse becomes easily reducible and when reduced remains inside without recurrence. This method of postural evacuation prevents the straining and the lubrication of the bowel produces a soft motion in bed, preventing its recurrence. The child is kept in this splint for a minimum period of a fortnight during which time it picks up weight and general health, and thus cure is obtained. Ten

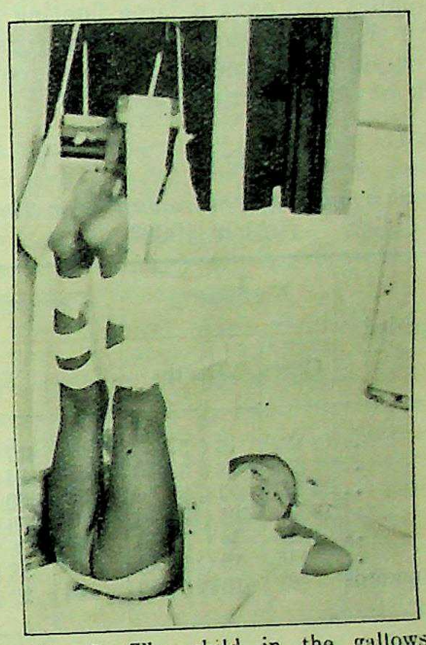

Fig. 2.—The child in the gallows splint with extension of limbs and reduction of prolapse, ten days after the institution of treatment. Note the general well-being of the patient.

children with complete prolapse were treated in this way and all the children had a cure at the time of discharge and on follow up four have reported no recurrence, two have died due to other diseases and four have not replied due to improper address and other causes.

Conclusion

The essential part of the treatment is reduction of prolapse and to maintain it reduced until the general condition is improved and the cause dealt with. The use of gallows splint has contributed to the rapid cure of this condition and has proved useful for the following reasons :—

(1) It necessarily confines the child to bed.
(2) It gives complete rest which is so necessary in debilitated children.
(3) Raising of buttocks helps in the reduction of congestion associated with prolapse and thus helps in its reduction and prevents recurrence.
(4) It facilitates nursing and especially the use of bed-pan for an easy evacuation without disturbing the child.

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SMALLPOX AND SULPHONAMIDE

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and
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Introduction

Smallpox is primarily a disease of children, but the introduction of protective vaccination in early childhood has resulted in the greater prevalence of the disease among the adult population.

In Bombay, we have a large floating population who migrate periodically from rural areas in search of employment and these constitute the bulk of our labouring class.

Table I

Compiled from hospital records for the years 1923 *to* 1939*

Age period	Vaccinated		Unvaccinated	
	Cases	Deaths	Cases	Deaths
0–5 ..	181	6 (3.3%)	1,085	457 (42.1%)
5–10 ..	232	8 (3.4%)	474	84 (17.6%)
10–20 ..	2,527	93 (3.7%)	1,529	429 (28.0%)
20–30 ..	2,839	203 (7.1%)	1,867	859 (46.0%)
30–40 ..	599	44 (7.3%)	491	225 (45.8%)
40–50 ..	115	19 (16.5%)	97	58 (60.0%)
50 and upwards	62	13 (21.0%)	51	29 (57.0%)

*Data taken from the Annual Reports of the City Fever Hospital, Arthur Road, Bombay, from 1923 to 1939.

This table is instructive in that it points to some important deductions, namely, (*i*) among the vaccinated the immunity wears off by the 10th year; (*ii*) the unvaccinated have a heavy mortality should they contract the disease; (*iii*) mortality among the vaccinated is considerably less, as compared with the unvaccinated.

In Bombay, we have smallpox with us every year; during some years the disease assumes epidemic proportions.

Hospital cases

Cases that are admitted into this hospital are from the poor labouring class and usually from the adult population. A good proportion of these cases seek hospital treatment only when the disease is in advanced stage.

Classification of smallpox cases

Cases which are admitted for treatment are grouped clinically under four types, namely, the discrete, the semi-confluent, the confluent, and the hæmorrhagic.

This table shows that under hospital treatment the mortality among the discrete cases is negligible; the confluent type has a mortality of about 47 per cent and this is due to the fact that these cases develop a septic stage from which many succumb. The hæmorrhagic type has the highest mortality, 88 per cent.

In the discrete type, the deaths that occur are due to pneumonia. In the semi-confluent type, deaths occur only in those cases which develop sepsis, and the mortality varies from 4 to 20 per cent. In the confluent type the deaths are mainly due to sepsis. The stage of suppuration is usually on the 7th or the 8th day of the disease, and the patient succumbs to septicæmia or toxæmia. The infecting organism in the majority of the cases is the staphylococcus, but in some cases streptococci are also found. Specific treatment with vaccines and sera has not been a success. This type may be further subdivided into two varieties; in one the rash is flat instead of being raised and prominently projected; in the other the rash presents the usual characteristics. The hæmorrhagic type is the most severe manifestation of the disease;

Table II

Compiled from hospital records for the years 1930 *to* 1939

Years	Discrete		Semi-confluent		Confluent		Hæmorrhagic	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
1930 ..	559	6	308	18	224	83	204	169
1931 ..	14	0	4	0	5	2	6	4
1932 ..	136	0	80	1	37	15	49	44
1933 ..	1,130	4	436	33	294	138	257	236
1934 ..	57	0	50	1	30	18	26	21
1935 ..	361	0	232	8	214	78	114	99
1936 ..	217	0	275	9	139	62	79	67
1937 ..	286	0	193	5	144	94	28	27
1938 ..	837	0	305	3	398	199	131	121
1939 ..	106	0	56	3	32	21	16	15
10 years ..	3,703	(0.2%)	1,939	(4.1%)	1,517	(46.8%)	910	(88.2%)

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in this also, we have noted two forms; in one the hæmorrhage occurs from the onset of the disease, and the rash is of the purpuric variety while there are hæmorrhages from the mucous membranes of the conjunctiva, mouth, etc. It is also attended with hæmaturia, melæna, hæmoptysis and hæmatemesis. The patient usually succumbs within 7 to 10 days of the onset. In the other variety hæmorrhage is not seen until after the rash has fully developed; it is then found in the pox. This type has been described as hæmorrhagica pustulosa. These cases have been treated in the past with serum from convalescent cases; the results have not been encouraging, as the mortality among the treated was nearly the same as in the control cases.

Researches into the treatment of confluent and hæmorrhagic cases

In 1924, 25 cases of the hæmorrhagic type were treated with convalescent serum and the results were not encouraging; the late Dr. Patel considered that 'the antitoxins in 20 c.cm. of the convalescent serum are probably not enough to neutralize all the toxins in the body'.

In 1933, some selected cases of the confluent and hæmorrhagic types were treated with sera obtained from calves used for the preparation of vaccine lymph at Belgaum, serum obtained from locally immunized sheep, and serum from convalescent patients.

TABLE III

Treatment	Cases	Deaths	Controls	Deaths
Calf serum ..	20	15	20	14
Sheep serum ..	2	2	2	2
Convalescent serum	25	20	25	18

During the same year, confluent and hæmorrhagic cases were exposed to the rays of Vitalux lamp for varying periods from 5 to 30 minutes according as the patient could bear the heat. These rays had definite result in drying up the pox earlier than usual in the septic stage.

During the year 1938-1939, some selected cases of the septic confluent type were treated with sulphonamide and uleron administered orally.

TABLE IV

Treatment	Cases	Mortality, per cent
Sulphonamide	125	25.0
Uleron	19	32.0
M.&B. 693	16	37.5

Uleron seemed to be definitely toxic in the doses administered; some of the cases were treated with M.&B. 693 in the early eruptive stage, before the development of pustules. It neither aborted the eruptive stage, nor did it prevent the development of the pustular stage. Sulphonamide seemed to be effective in the treatment of the late septic manifestations such as septicæmia, arthritis, furunculosis and in lung complications.

Sulphonamide and confluent smallpox

Results obtained with sulphonamide in the selected cases treated during 1938-1939 justified a further trial with the drug during this year with adequate controls.

From January to May 1940, we have treated 91 cases of the semi-confluent type with 64 controls and 60 cases of the confluent type with 63 controls. In June there has been a great drop in admissions for smallpox. As one of us (T. B. P.) has taken up a new post it seemed desirable that the results we have obtained be summarized in order that others engaged in the treatment of smallpox may give further trial to this drug, so that in course of time a successful way of dealing with the confluent type of smallpox may be evolved.

The sulphonamide group of drugs have established their therapeutic value in the treatment of diseases such as cerebrospinal fever, pneumonia, gonorrhœa and puerperal fever. It is claimed that the drug is specific against organisms of sepsis, staphylococci and streptococci. Our results in the treatment of confluent cases of smallpox justify the use of this drug.

TABLE V

Summary of cases treated with sulphonamide during January to May 1940

	Treated	Mortality, per cent	Controls	Mortality, per cent
Semi-confluent cases:				
Vaccinated	59	18.6	32	28.1
Unvaccinated	32	18.7	32	34.4
Confluent cases:				
Vaccinated	32	50.0	30	93.3
Unvaccinated	28	64.3	31	93.5

These figures are admittedly small, but that sulphonamide does exert a beneficial action is clear.

We have employed sulphonamide tablets sold by Parke, Davis & Co. and by Glaxo Laboratories. Two tablets were administered orally at four-hourly intervals for the first 7 days; thereafter one tablet was given four-hourly for the next 7 days. The maximum amount administered varied from 44 to 47.5 grammes. In a very large number of cases the amount of the drug administered was small, as the drug was withheld as soon as the temperature reached normal.

During the administration of sulphonamide we have observed very few untoward symptoms :

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AURICULAR FLUTTER

By T. K. RAMAN, M.D., D.T.M. (Cal.)
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AURICULAR flutter was first described by McWilliam in 1887 (Mackenzie, 1925) as a result of experimental stimulation. Ritchie (1905) obtained graphic records from the jugular vein, and Jolly and Ritchie (1908) (Mackenzie, *loc. cit.*) took electrocardiographic tracings from one of Ritchie's cases of auricular flutter. Mackenzie looking back through his old records found cases of auricular flutter which went on to auricular fibrillation. The condition then became a well-recognized clinical entity, and according to Mackenzie 'it is among the easiest to recognize without the aid of instruments'.

This is a rare condition. Sprague and White (East and Bain, 1936) worked out the ratio of auricular flutter to auricular fibrillation as 1 : 13. Mackenzie (*loc. cit.*) described fifteen cases of flutter, some of which went on to fibrillation. In this series of cases there were two of auricular flutter and thirty-nine of auricular fibrillation (Raman, 1937) which works out at the ratio of 1 : 19. A brief summary of two cases is given below :—

Case 1.—A male, aged 40 years, was admitted on 4th May, 1931, with dyspnœa of four months' duration. Eight months before admission he had pain over the præcordium and slight breathlessness after severe exertion. About three months later he was picked up from the road unconscious.

Physical examination.—The patient was in a condition of extreme dyspnœa, with general anasarca, cyanosis, prominent jugular veins and enlarged liver; a condition of advanced congestive heart failure. Pulse was rapid and regular (150 per minute). Heart was enlarged with systolic murmur in the mitral and tricuspid areas. Blood pressure 108/85. The condition remained practically the same for 48 hours in spite of large doses of digitalis by mouth and stropanthin intravenously. On 6th May, 1931, the patient's condition improved and the heart became irregular. Electrocardiogram showed auricular fibrillation. This condition persisted for a few days and was confirmed by electrocardiogram. His pulse became regular and electrocardiogram on 18th May, 1931, showed regular sinus rhythm and he was discharged on 24th May, 1931. He was readmitted on 16th April, 1932, with signs of congestive heart failure with a pulse rate of 130 per minute regular, with moderate volume and tension. Blood pressure 114/86. During the period of four months he was in hospital he passed through the different stages of auricular fibrillation, auricular flutter, and regular sinus rhythm. The diagnosis was confirmed by electrocardiograph. During his stay in hospital of three weeks in 1931 and four months in 1932 he had three paroxysms of auricular flutter, the auricular rate being 300 and ventricular rate 150. Only on two occasions did he show regular sinus rhythm in the electrocardiograph. The electrocardiographic findings in nine plates were:—

Auricular flutter	2
(Auricular rate 300, ventricular rate 150)	
Auricular fibrillation	5
Normal rhythm	2
TOTAL ..	9

He was discharged on 16th August, 1932, with improvement in his condition. He could not be followed further.

Case 2.—Male, aged 30 years, admitted on 18th February, 1933, with signs of congestive heart failure. Heart was enlarged, apex beat being displaced to

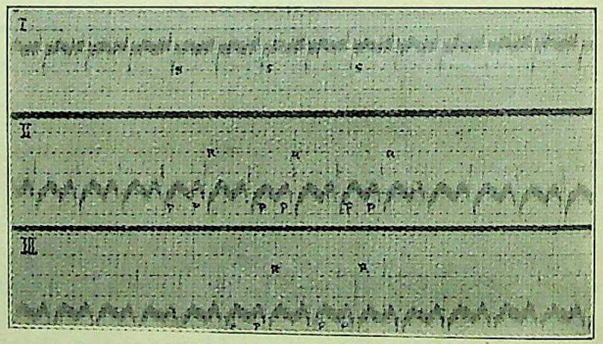

Fig. 1. (Case 2).—Leads I, II and III showing auricular flutter (ratio 2 : 1) and right ventricular preponderance. Auricular waves are shown (P).

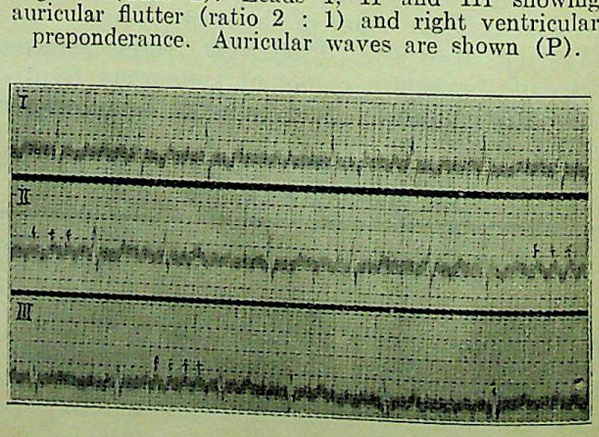

Fig. 2. (Case 2).—Leads I, II and III showing auricular fibrillation in the same patient taken after a few days. Fibrillary waves are shown (f).

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the chief of these was vomiting, which occurred in 38 per cent of the treated cases; cyanosis was observed in 3 cases; in one case there was hæmaturia on the 4th day of the administration of the drug; in this case the patient made an uneventful recovery with the stoppage of the drug.

Conclusions

(*i*) Among the cases admitted for hospital treatment for smallpox, nearly 50 per cent are unvaccinated.

(*ii*) A very large percentage of admissions have been from the adult population.

(*iii*) The mortality among the vaccinated is low as compared with that amongst the unvaccinated.

(*iv*) Confluent and hæmorrhagic types of smallpox occur among the vaccinated as well as the unvaccinated.

(*v*) Administration of sulphonamide reduces the mortality in confluent cases by about 30 per cent.

(*vi*) Sulphonamide has no influence on the course of smallpox except in cases of the septic type.

(*vii*) The drug has no effect on hæmorrhagic cases.

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A SIMPLE TREATMENT OF DYSENTERIES AND DIARRHŒAS

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LIEUTENANT-COLONEL, I.M.S.
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IN the *mofussil* where hospital funds do not permit the free use of expensive medicines civil surgeons have to find cheap but efficacious substitutes. There are several indigenous drugs in India and workers have from time to time brought them to light. One of these is espagol or ispaghula, seeds of *Plantago ovata* or *Spogel* seeds. The dose of the whole seed is 30 to 120 grains, and of the flakes or pericarps 10 to 15 grains. It is a very common village medicine and is easily available at *pansari* shops at 4 to 6 annas a seer.

During my term of office at Burdwan (1930–37) I tried it in many cases of bowel trouble (chiefly dysenteries) and obtained very satisfactory results. Its action was consistently good. We did not, however, keep any record of cases, of the amount of the drug required for cure or of the number of days the seeds or their pericarps were given, to effect cures.

At Mymensingh (1937–39) the use of this drug was continued on a much larger scale in all cases of bowel trouble. Some data were also kept to show the amount given and the length of treatment. It was noticed that in the great majority of cases one ounce given in four days was sufficient to produce the desired effect. It was also noticed that acute cases reacted more quickly than the chronic ones, but both were brought under some control within two days.

The treatment adopted is as follows :—

Ispaghula seeds are cleaned and a fresh decoction is prepared daily with two drachms of the seeds in one pint of water boiled for ten to fifteen minutes, shaken well and then strained through a cloth. This gives about 16 ounces of decoction which is sweetened to taste with sugar, and given to the patient every morning for drinking during the day.

He starts in the morning with three ounces every two hours and finishes the 16 ounces by the evening. It is a very soothing and pleasant drink and naturally the patients prefer it to the usual castor oil emulsion or the magnesium sulphate mixture. In fact, they enjoy this treatment not only because of its taste but also because of its quick action in making them comfortable by stopping griping and lessening the number of stools.

In cases where there is much blood with the motions I give calcium lactate in 10 grain doses thrice a day in addition to the ispaghula decoction and in those cases where stools are too frequent—6 or more in 24 hours—I add 5 to 10 grains of alum to the bottle of decoction meant for the day.

Ispaghula decoction acts mechanically by coating the inflamed or ulcerated surface with a thin layer of mucilage and protecting it from the irritating secretions. It has also some astringent effect and the character of the stools begins to change from watery and loose to semi-solid and formed, and mucus and blood get less after 24 hours' treatment. Its soothing action gives great relief to the patient.

Calcium lactate and alum are a great help. They are stopped directly the blood in the stool disappears and the number of motions is reduced to two or three a day.

The result of this treatment is so uniformly good and encouraging that I have started it as a routine in the Howrah General Hospital and other institutions under me, with excellent results.

Where possible, the stools are examined and in amœbic dysentery in addition to the ispaghula decoction a course of emetine injections given.

It is a simple and inexpensive treatment which can be carried out even in out-of-the-way places. I therefore thought it worth while bringing it to the notice of the profession for more extensive trial.

[Ispaghula is a useful Indian remedy which has been used regularly in the Calcutta School of Tropical Medicine in chronic forms of diarrhœa or dysentery for

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three inches beyond the left nipple line. A systolic murmur was heard in the mitral area conducted towards the axilla. Blood pressure 100/60. During his stay of five months in hospital he used to get paroxysms of auricular flutter which passed on to auricular fibrillation. Normal rhythm was restored during the interval. As a result of treatment signs and symptoms of congestive heart failure disappeared but the auricular fibrillation persisted. He was discharged on 7th July, 1933, and was not followed further. The electrocardiographic findings in four plates were: Auricular flutter 2 (figure 1). (Auricular rate 288, ventricular rate 144.) Auricular fibrillation 2 (figure 2).

Both were cases of double mitral, rheumatic in origin. Case 1 showed three and case 2 two paroxysms of auricular flutter (ratio 2 : 1). The transition from auricular flutter to fibrillation and from fibrillation to normal rhythm could be seen in both the patients. Normal rhythm was restored at the time of discharge in case 1 and in case 2 fibrillation persisted.

Summary

Two cases of auricular flutter, rheumatic in origin, are described.

Acknowledgments

My thanks are due to Dr. G. Dinker Rao and Dr. P. Kutumbiah for the clinical reports, and to Dr. P. Kesavaswamy for the prints of electrocardiograms.

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GOITRE IN THE DISTRICT OF KANGRA (PUNJAB)*

By NAND LAL BAJAJ, L.S.M.F.

In-charge, Civil Dispensary, Barsar P. O., District Kangra (Punjab)

A QUESTIONNAIRE on goitre relating to the years 1937 and 1938 was sent to all the medical officers of the Kangra district to find out the incidence of this disease, the treatment adopted, particularly surgical, and to elicit other points likely to prove of interest to the profession.

The following is the summary of the conclusions arrived at from their combined replies :—

(*i*) Goitre is most common in Kulu valley, less in Hamirpur tehsil, next in Kangra and Hamirpur tehsils, while it is least prevalent in the tehsil of Dehra Gopipur. In Keylang and Spiti areas (ten to twenty thousand feet altitude) a few cases of goitre are seen.

(*ii*) In all 13,500 new patients with goitre were treated in the entire district during the years 1937 and 1938.

(*iii*) By medicinal treatment only some cases of small parenchymatous goitre of short duration were cured, the rest getting some relief, the size of the swellings increasing again after suspension of the treatment.

(*iv*) No one mentioned any special or new medicine that acted more efficaciously than those already known to us.

(*v*) No goitre operation was performed in any hospital of the district during the two years referred to above, nor does any one mention any special experiences with this disease, excepting one who discovered that the water from a stream three miles away from his dispensary produced goitre, while that obtained from a well near that channel had a preventive and to some extent a curative effect.

My object in writing this article is to stimulate interest in the surgical treatment of goitre. What I wish to emphasize is that goitre should no longer continue to remain a bugbear, as it was in the past even for the most eminent surgeons. Little mention shall be made of malignant or exophthalmic goitre of which few cases are seen in practice, nor do the patients seek advice early enough for any life-saving surgical measures to be adopted. For instance, I have come across only three cases of exophthalmic goitre and four malignant ones, all too far advanced to allow any surgical intervention.

I suppose no one can satisfactorily describe the treatment of goitre without mentioning its causes, as the prophylaxis of this malady like other diseases rests upon removing the cause. Although nothing absolutely definite is known about its ætiology yet the following important predisposing and to some extent the exciting causes may be briefly outlined; the prophylactic treatment will also be considered :—

(*i*) Deficiency of iodine in the soil, and consequently in the seeds, cereals, water, etc., of the districts which provide goitre patients. It is believed that there is deficiency of other minerals too, but iodine is the most important. There are goitre-producing springs, as the villagers will sometimes tell you, and goitre-cure springs, and it has been observed that, whereas the iodine content of the water of the latter is good, it is almost absent in the former. Hence administration of iodine, in any suitable form and dose, through any convenient route is the most important prophylactic measure. For this purpose in endemic areas, sodium iodide, grs. 3 a day, for ten days, twice a year, is supposed to suffice.

(*ii*) Want of sunshine is, in my personal experience, the next important ætiological factor. In the Kutlehar valley which is known throughout the districts of Kangra, Simla, and Hoshiarpur for producing goitre, the sun rises about two hours later and sets two and a half hours earlier than its neighbouring areas. In some villages in the same valley, sunshine cannot be enjoyed for more than four or five hours a day in winter and seven or eight hours in summer. I have repeatedly seen that the vast majority of goitre patients attending the hospital for treatment belong to places where there is little sun and a poor circulation of air around them.

(*iii*) Pollution of the water by some, up to this time unknown, organism is thought to be responsible for the sudden outbreak of goitre in an epidemic form. When the infection dies out the disease also ceases to spread. There is a valley of this type in Hamirpur tehsil of this district, where they say goitre appears intermittently in a severe form, occasionally ending several lives (acute goitre). Boiling of water is certainly a good preventive measure for such places.

(*iv*) Other factors suggested are insanitary conditions, low vital capacity, intestinal intoxication and lifting of heavy weights on the head; this last has, in my opinion, little to do with the production of goitre, for most of the people carry weights on the back in those hilly districts.

(*v*) More cases come after the rainy season, *i.e.*, in the months of October and November, probably because heavy rains cause more pollution of water supplies and also wash away more iodine from the soil.

My thanks are due to Dr. G. W. Hardy, my civil surgeon, for his kind permission to publish this article.

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* Abridged by Editor.

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the last 15 years. There are 10 pages devoted to this drug in *Indigenous Drugs of India* (Chopra, 1933), and it is also mentioned in *The Dysenteries of India* (Acton and Knowles, 1928).

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Chopra, R. N. (1933). *Indigenous Drugs of India*. Art Press, Calcutta.—EDITOR, *I. M. G.*]

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THE INVESTIGATION OF PARROTS IN CALCUTTA FOR PRESENCE OF PSITTACOSIS AND BRAZILIAN VIRUS

By R. K. GOYAL, M.B., D.SC., PH.D., M.R.C.P.
(From the School of Tropical Medicine, Calcutta)

No cases of psittacosis have been reported in India, but the causative agent may be present in wild parrots, for, although no cases of psittacosis in man were reported from Australia before 1934, yet Burnet (1935) concluded from his observations that a low-grade form of psittacosis infection has been enzootic amongst Australian parrots for centuries, and Meyer and Eddie (1934) reported the presence, for the first time, of psittacosis in birds arriving in California from South American ports. In the absence of any data about Indian parrots, we undertook the investigation of this problem. Rivers and Schwentker (1932) have published the details of a parrot virus disease originally described by Pacheco, Bier and Mayer (Brazilian virus). We looked for both psittacosis and Pacheco's virus.

The parrots were obtained from the local markets shortly after their arrival from the jungle. They had been in a wild state previously and most of them were young. The parrots were killed by drowning or coal-gas and their feathers plucked. The thoracic and abdominal viscera were examined and the spleen was removed with sterile precautions. The size of the spleen was noted and enlarged spleens were made into a suspension and injected intraperitoneally into mice and intramuscularly into parrots. The small and medium-sized spleens were pooled and suspensions injected in the same way.

Some of the parrots examined were suffering from intercurrent bacterial infections, the inoculated mice died and showed the presence of a peritoneal exudate containing diphtheroids, diplococci and Gram-negative bacilli, but no L.C.L. bodies were detected. Repeated passages with the spleen and liver of affected mice led to the disappearance of the secondary bacterial infection and no evidence of a virus disease was obtained. The ether-treated spleen suspensions of sick parrots or L_3 candle filtrates gave entirely negative results. The other inoculated mice and parrots were sacrificed at intervals varying from one to four weeks; no abnormality was detected in general. Some of the parrots showed enlargement of the spleen and greyish-white mottling of the liver; the

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[*Note.*—The author then points out that surgical treatment is the treatment of choice and gives details of the surgical technique for the removal of the lateral lobes of the thyroid gland. He suggests that the harder lobe should first be removed and medical treatment continued when the other lobe will also 'harden up' and may then be removed.—EDITOR, *I. M. G.*]

THE Vi-AGGLUTINATION TEST IN ENTERIC FEVER

AN ANALYSIS OF 255 CASES

By N. SESHADRINATHAN, M.B., B.S., D.T.M.
and
M. NARAYANA PAI, M.B., B.S.

Introduction

THE Widal reaction has frequently been subjected to modifications to make it more specific. The widespread use of anti-typhoid inoculation has been an important factor interfering with the interpretation of the reaction, but the introduction of O-agglutination by Felix in 1924 for the detection of 'infection agglutinins' as against 'inoculation agglutinins' was a step forward in the diagnosis of enteric infections. Felix claimed that O-agglutinins are formed only in a true enteric infection, whereas H-agglutinins are found in inoculated individuals also and may be increased during the course of other fevers as a result of non-specific stimulation.

The discovery of a third antigen in *Bacillus typhosus*, namely, the Vi antigen of Felix and Pitt, 1934, has been followed by its use in the agglutination reaction for the diagnosis of enteric fever. Vi-agglutination has been shown to be specific for detecting typhoid infection (Felix and Bhatnagar, 1935). The method employed was too complicated for routine use for the Vi strains available up to the present

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affected organs were sectioned and a suspension also passaged into parrots and mice, with negative results.

Two hundred and fifty parrots were examined, they were locally known as green parrots and Kashmere parrots; the Indian parrot belongs to the genus *Paleornis*. The size of the spleen varied from 3 mm. to 11 mm. in diameter and about 25 per cent of the birds had enlarged spleens (8 mm. to 11 mm. in diameter). No pathological changes were found in sections of enlarged spleens. The sections of mottled livers showed areas of focal necrosis with round-cell infiltration and a deposit of hæmosiderin, but no acidophilic intranuclear inclusions were demonstrable.

Conclusion

An examination of 250 Indian parrots failed to reveal the presence of psittacosis, or Pacheco's virus.

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also contained O and H antigens and the patient's serum had to be absorbed with a special strain (such as H 901, which contains both O and H antigens) to remove O and H agglutinins before testing for Vi-agglutination.

Bhatnagar, Speechly and Singh (1938) described a non-motile Vi strain possessing only traces of O antigen and Bhatnagar (1938) used this strain for detecting Vi-agglutinins in sera. This technique enabled him to do away with the complication of a preliminary absorption of the patient's serum with O and H antigens, since the strain Vi-I of Bhatnagar is practically insensitive to O and H agglutinins.

With a view to adopting the Vi-agglutination test as a routine in the diagnosis of enteric fevers, the present investigation was undertaken. The series consists of 255 cases in which the diagnosis was established either as a result of a positive blood culture or, in cases where the culture was negative, by the temperature chart and other clinical findings in the cases.

Material employed

Samples of blood received from some of the hospitals in the city of Madras for Widal tests were used also for Vi-agglutination. The clinical records of these cases were investigated. The blood samples were centrifuged, sera separated and stored in the refrigerator overnight for testing next morning.

Technique

The Widal test was done with a live suspension of H 901 from a 24-hour culture. The dilutions used were 1 in 25, 50, 100 and 200 and the mixture of suspension and diluted serum was incubated in the water-bath at 52°C. for 2 hours. Readings were taken at the end of this period, allowing about 15 to 20 minutes for the agglutinated bacilli to settle down. O-agglutination was not carried out as practically all the cases in this investigation had received no prophylactic inoculation.

Vi-agglutination

A Vi-I strain, kindly supplied by Major Bhatnagar, was employed. The strain was maintained according to the instructions given in his paper. A 24-hour culture in bullock heart digest saccharose agar was suspended in sterile normal saline, and a live suspension with an opacity of about 8,000 millions per c.cm. was made. We found clearer readings with slightly weaker suspensions, *i.e.*, 6 to 8 thousand millions. A pipette was graduated so that 20 drops were equivalent to 1 c.cm.

Glass tubes with a curved bottom and a diameter of 1 cm. and a height of 5 cm. (generally employed in the institute for Kahn and Wassermann tests) were used for the serum dilutions. The dilutions used were 1 in 10, 25, 50, 100 and 200, the volume of the serum dilution being 1 c.cm. in each tube. With the graduated pipette mentioned above, 1 drop of the living suspension of Vi-I strain was put into each of the tubes and a control tube (with 1 c.cm. of normal saline and 1 drop of the suspension) was also put up. The racks were well shaken and incubated at 37°C. for 2 hours in the incubator. At the end of this period, the racks were transferred to a cold incubator and kept overnight at a temperature of about 20°C. Readings were taken next morning.

Room temperature in our laboratory varies from 30 to 35°C. We found that, if the racks were kept at laboratory temperature until next day, the readings were vitiated, probably owing to contamination. Keeping the racks in the cold incubator prevented undue contamination and the readings were satisfactory. The readings were taken according to instructions given by Major Bhatnagar. Each tube was examined with the naked eye as well as with the magnifying lens and the reading was confirmed by gently shaking the tube. In doubtful cases, the test was repeated.

Out of the 255 cases, 202 gave a positive Vi-agglutination (1 in 10 and above) but only 160 gave a positive H-agglutination of 1 in 25 and above. (In a series of 75 consecutive cases, we found that when the H-agglutination was negative 1 in 25, it was also negative 1 in 10.) Hence, a dilution of 1 in 10 was not found necessary for comparison with Vi-agglutination.

The following table gives the number and percentage of positive Vi-agglutination and positive H-agglutination during different stages of the fever :—

TABLE I

	Positive in the first week of fever	Positive between 7th and 10th days of fever	Positive at a later stage, *i.e.*, beyond 10 days	Cases in which day of fever was not known	Total
Vi-agglutination ..	18 (9 per cent)	49 (24.3 per cent)	97 (48 per cent)	38	202
H-agglutination ..	8 (5 „)	40 (25.0 „)	82 (50 „)	30	160

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The above figures show that only 53 (20 per cent) cases of enteric gave a negative Vi-agglutination, whereas 95 (37.2 per cent) cases gave a negative H-agglutination.

Some special features noted during the investigation

Case 1.—J. A., female, an inmate of a convent is a case of special interest. Her blood was taken for culture and Widal during an investigation into the source of infection in an outbreak of enteric fever in the convent. At the time blood was taken, she was apparently in normal health. She, however, developed fever next day and was later admitted into hospital. The results of blood culture and Widal (on 17th February, 1940) were as follows:—

Blood culture: *B. paratyphosus A* isolated.

H-agglutination: Negative 1 in 10 for *B. typhosus* (H).

Negative 1 in 25 for *B. paratyphosus A, B* and *C*.

Vi-agglutination was positive 1 in 10.

On 24th February, the blood was again tested.

H-agglutination was negative 1 in 10 for *B. typhosus* (H) and *B. paratyphosus A, B* and *C*.

Vi-agglutination was positive 1 in 25.

B. typhosus but not *B. paratyphosus A* was isolated from the blood.

In this case, apparently, Vi-agglutination was demonstrable very early, immediately before the acute onset of the disease, and was positive in a higher dilution one week later, whereas H-agglutination was negative on both occasions. This was a mixed infection of *B. typhosus* and *B. paratyphosus A*.

Case 2.—Female, aged 18 years, inmate of the same convent.

On 17th February, 1940, *B. paratyphosus A* was isolated from the blood and H-agglutination was negative 1 in 10 for *B. typhosus* and negative 1 in 25 for *B. paratyphosus A, B* and *C*. Vi-agglutination was positive 1 in 50. On 24th February, H-agglutination was positive 1 in 200 for *B. typhosus* (H) and *B. paratyphosus A*. Vi-agglutination was still positive 1 in 50. *B. paratyphosus A* was again isolated from the blood. In this case, it is not known whether the patient had a mixed infection with *B. typhosus* as well, but the possibility cannot be excluded as both cases came from the same convent and had been infected from the same source at the same time.

We are indebted to Dr. Y. S. Narayana Rao of the King Institute for information regarding these two cases.

Case 3.—Hindu male, aged 10 years, was admitted into hospital with a history of continuous fever for about a week. On the 11th day of the fever, the blood was tested. Both H- and Vi-agglutination tests were negative 1 in 10. *B. typhosus* was isolated from the blood. The blood was again tested on the 24th day of the fever. This time H-agglutination was again negative 1 in 10, but Vi-agglutination was positive 1 in 50. Blood culture was not done on the second occasion. The strain isolated on the first occasion agglutinated with Vi, H, and O sera.

This is a case in which the H-agglutination did not help in the diagnosis. The clinical picture was very typical and diagnosis was confirmed by positive blood culture. The Vi-agglutinins in this case appeared only late in the disease (24th day of the fever).

Case 4.—Female, aged 14 years, admitted into hospital with continuous fever. She had been inoculated with T.A.B. vaccine 6 months previous to infection. The H-agglutination and Vi-agglutination on the 12th day of fever were both negative 1 in 10. *B. typhosus* was isolated from the blood on the 12th day. The patient died in hospital soon after, so that the tests could not be repeated. The strain isolated agglutinated with all the three sera, *viz*, H, O, and Vi.

Cases 5, 6 *and* 7.—These 3 cases were females aged 25, 20, and 20 years, respectively. They were admitted into hospital about the same time and samples of their blood were sent on the same day for examination.

B. paratyphosus B was isolated from the blood from all 3 cases and the results of the H-agglutination and Vi tests are as follows:—

		H-agglutination	Vi-agglutination
Case 5	*B. typhosus* (H) / Para A, B and C	− 25	+ 25
Case 6	*B. typhosus* (H)	+ 100	
	Para A, B and C	− 25	− 10
Case 7	*B. typhosus* (H)	+ 200	
	Para A, B and C	− 25	+ 50

We are unable to explain the positive Vi-agglutinins in 2 of these cases, as, unfortunately, no clinical details were available.

In the following 9 cases, the Vi test was repeated on a second occasion. In only 5 of these was the H-agglutination repeated. These are shown in table II.

Conclusions

The results in table I show that in the first week of the disease, a higher percentage (9 per cent) of cases showed a positive Vi-agglutination than H-agglutination (5 per cent), whereas in the second and subsequent weeks, there was no appreciable difference. The percentage of Vi-positive cases was 79.2, whereas the percentage of positive H-agglutination cases was 63.

In 109 cases in which *B. typhosus* was isolated from the blood, 84 (77.1 per cent) gave a positive Vi-agglutination, whereas 68 gave a positive H-agglutination (62.4 per cent).

The earliest day of the disease on which a positive Vi-agglutination was obtained was the second day (case 1). The latest day on which Vi-agglutinins were present was the 39th day (case 9 ? relapse). The maximum Vi titre noted was 1 in 400 (complete) and 1 in 600 (partial agglutination).

Out of 39 cases which were clinically not enteric 12 cases gave a positive Vi-agglutination, 5 positive 1 in 10, 4 positive 1 in 25, 2 positive 1 in 50, and 1 positive 1 in 200, whereas 5 cases gave positive H-agglutination, 2 cases positive 1 in 25, 1 case positive 1 in 50, and 2 cases positive 1 in 200. No conclusions, however, can be drawn as to the specificity of the Vi test from these figures alone as the number is too small, and as there are no data available as to the percentage of the normal population exhibiting typhoid agglutinins in the blood.

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TABLE II

	Day of fever	H-agglutination	Vi-agglutination	REMARKS
Case 8	8th day 15th „	— 25 +200	+ 25 +100	Clinically enteric.
Case 9	30th day 39th „	— 25 +200	+ 25 +100	*B. typhosus* (Vi strain) was isolated on the 30th day. Relapse?
Case 10	7th day 20th „	— 25 Not done	— 10 + 50	*B. typhosus* isolated from blood on 7th day.
Case 11	7th day After 9 weeks when the patient had fully recovered from the fever.	— 25 Not done	+ 50 + 25	*B. typhosus* isolated on the 7th day.
Case 12	8th day 24th „	— 10 Not done	+ 50 +200	Clinically typical enteric.
Case 13	14th day 21st „	— 10 +200	— 10 + 25	*B. typhosus* isolated.
Case 14	11th day 24th „	— 10 — 10	— 10 + 50	*B. typhosus* isolated. This strain agglutinated with Vi serum, 'H' and 'O' sera.
Case 15	13th day 24th „	— 10 — 10	+ 10 — 10	Clinically enteric.
Case 16	18th day 22nd „	+200 Not done	+200 +400	Clinically enteric.

Statistical note by Mr. Sastri, statistician of the University of Madras

	Positive reactions	Negative reactions	Total
Vi-agglutination	202	53	255
H-agglutination	160	95	255

Proportion of positive reactions in Vi .. 0.7922
Proportion of positive reactions in H .. 0.6274
Difference .. 0.1648

Standard error of the difference :

$$\sqrt{\frac{0.7922 \times 0.2078 + 0.6274 \times 0.3726}{255}} = 0.0395$$

Therefore, $\frac{\text{Difference}}{\text{Standard error of difference}} = \frac{0.1648}{0.0395} = 4.172$

Hence, the difference is highly significant and in detection Vi-agglutination is superior to H-agglutination.

Positive reaction

	Vi-agglutination	H-agglutination
Enteric fever cases	202	160
Non-enteric fever cases.	12	5
	214	165

Out of the 214 cases giving positive reaction by Vi method, 94.4 per cent had enteric fever.

Out of 165 cases giving positive reaction by H-agglutination method, 97.0 per cent had fever.

We have to find out whether the difference between the two proportions is significant or not, to test whether one of the methods is more efficient in making correct diagnosis than the other.

Standard error of difference:

$$\sqrt{\frac{0.944 \times 0.56}{214} + \frac{0.970 \times 0.030}{165}} = 0.021$$

Therefore, $\frac{\text{Difference}}{\text{Standard error}} = \frac{0.026}{0.021} = 1.238$

Hence, the difference is not significant. From this we cannot say that the specificity of H-agglutination is superior to Vi-agglutination. But it must be noted that the number of non-enteric cases is too small compared with enteric cases.

Acknowledgments

We are indebted to Dr. C. G. Pandit, Acting Director, King Institute, and to Lieut.-Colonel H. E. Shortt, I.M.S., Director, King Institute, Guindy, for their encouragement, to the latter also for helpful suggestions and criticism in the preparation of this paper. Our thanks are also due to the superintendents of the Government Royapuram, Government Royapettah, Government Victoria Caste and Gosha and Government Women and Children Hospitals for their permission to make use of the clinical material. We are also thankful to Dr. S. Venkatasamy of the King Institute, Guindy, for his assistance in this investigation.

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EXISTENCE OF LEPTOSPIROSIS IN RANGOON

By B. M. DAS GUPTA

(From the Protozoology Department, Calcutta School of Tropical Medicine)

TAYLOR and GOYLE (1931) found in Rangoon that out of 100 *Nesokia bengalensis* examined 42 were infected with leptospira, while among the house rats, *Rattus rattus* and *R. concolor*, 23 showed the infection. They also noted that a rat strain isolated in Rangoon corresponded with a Sumatra rat strain, but not with human strains isolated by these workers in the Andamans.

There is little doubt that human leptospirosis also exists in Burma, although there is, as far as I am aware, no published record of the occurrence of the disease*.

In July 1939, Lieut.-Colonel G. C. Maitra, I.M.S., the then Director of the Pasteur Institute, Rangoon, sent to me a specimen of serum from a case of jaundice with a request to perform an agglutination test for evidence of leptospiral infection. The serum was put up against the different strains of leptospira then available in my laboratory.

TABLE I

Strains	SERUM DILUTIONS			
	1–20	1–40	1–80	1–160
Strain Chopra, Calcutta (classical *L. icterohæmorrhagiæ*).	+	+	+	+
Strain Wijnberg (classical *L. icterohæmorrhagiæ*).	+	+	+	+
Strain Andamans CH31	–	–	–	–
Strain Andamans CH11	–	–	–	–
Strain Mg. Tin Tin* ..	+	±	–	–

*This strain was isolated by me from an Andaman case; homologous with a Java bat strain, 90C.

In order to obtain the limit of agglutination, further dilutions were made as follows : — .

TABLE II

	1–1,000	1–10,000	1–100,000	1–1,000,000
Strain Chopra	+	+	+	∓
Strain Wijnberg	±	–	–	–

It is evident from the results presented in the above tables that the serum was obtained from

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*Since this paper was sent to the press, I have come across a reference to the occurrence of leptospiral jaundice in Rangoon in the 'Annual Report of the Burma Pasteur Institute and Bacteriological Laboratory for the year ending 31st December, 1929, and the 31st March, 1930, respectively'. The serological nature of the causal organism was not, however, determined.

RABIES IN LOWLIER ANIMALS

By S. D. S. GREVAL

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The School of Tropical Medicine, Calcutta

and

M. J. NICHOLAS, I.M.D.

The Pasteur Institute, Calcutta

Advice in a case of tortoise bite

A RESIDENT of 'A' in the United Provinces was bitten by a tortoise while bathing in the river. Advice regarding anti-rabies treatment was required at Calcutta by a relative on 17th October, 1940.

Tortoises do not usually bite bathers in rivers. Two questions arose—Was there anything wrong with this particular tortoise ? Had anybody at 'A' ever heard of a case of rabies in man or animals after a tortoise bite ? These questions could not be answered satisfactorily by the relative. The advice given was that the treatment should be taken if the biting animal had behaved in an obviously unusual manner and if cases of rabies in man or animals were known to have occurred from bites of tortoises.

Rabies in the tortoise

There is no mention in the available literature on the subject, in English or French, of naturally-occurring rabies in tortoises. Street virus, however, has been injected into brains of turtles and proved by passage into rabbit brain to have persisted for months. In the brains of *Testudo mauritanica* and *Clemmys leprosa* (a fresh-water species) it persisted for 302 and 150 days, respectively (Remlinger and Bailly, 1931, 1932). The turtles did not show any sign of rabies.

The difference between turtles and tortoises is not sharp. That a tortoise can acquire infection in nature, remain healthy and impart infection by bite are possibilities. Identical occurrences have been observed in bats.

Incidentally, 'unusual' behaviour may and actually does fall short of signs of rabies and yet is a very useful guide in rabies. When during a hunt jackals turn on the hounds they behave unusually. Rabies in the pack usually follows.

(Continued from previous column)

a case of leptospirosis and the infecting organism was homologous with the classical *L. icterohæmorrhagiæ*.

My thanks are due to Lieut.-Colonel G. C. Maitra, I.M.S., Director, Pasteur Institute, Rangoon, for sending me the material on which this note is based.

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Local information regarding incidence of rabies, specially from small localities, is very valuable. The impression produced by the actual suffering of this rare catastrophe and by the hopelessness of the situation is retained by the inhabitants for a long time.

Rabies in other lowlier animals

Other lowlier animals which have been experimented upon are the hedgehog (*Eurinaceus europeus*) and the spermophile (*Spermophilus citillus*). The spermophiles were resistent during hibernation. The hedgehogs, on the other hand, transformed the fixed virus into the street virus (Jonnesco, 1932). The latter experiment would show that the hedgehog was particularly suitable to be a host of rabies virus. It may be one of the natural reservoirs.

Zoologically hedgehogs and spermophiles being mammals are above tortoises which are reptiles. In popular language, however, all of them are lowlier animals amongst the lower animals.

Attention has been recently drawn to bats, some of which have definitely been proved to carry rabies and others are, therefore, under suspicion (Greval and Nicholas, 1940). The bats are also lowlier animals.

Attention was also drawn to rabies in the mongoose (Greval; 1932, 1933). The mongoose, however, is a carnivore and ranks with the dog which is not a lowlier animal.

Natural reservoir of rabies

One of us (Greval, *loc. cit.*) has suggested that like the fire in ancient India, before the introduction of matches, rabies smoulders in forests and flares in human habitations. The smouldering probably occurs in the wild carnivores which do not always die of it. It is now suggested that it may occur even in the lowlier animals which may not be much inconvenienced by it. It is not in the best biological interest of a parasite always to cause lethal infection, *e.g.*, rabies in lower animals and man. Such an infection would exhaust the supply of hosts in time and thus terminate the existence of the parasite.

Danger of anti-rabies treatment

In taking the treatment there is a risk of developing the post-treatment paralysis. The paralysis, however, is a rare event and the risk must be preferred to certain death, should rabies develop as a result of the bite. Besides, the majority of cases of paralysis, definitely attributable to treatment, which have come to the knowledge of the writers during the last 19 years, have completely recovered. During the last six years, out of 35 cases reported from the various anti-rabies institutes of India and Burma only 7 proved fatal.

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(Continued at foot of next column)

ON USING WATER INSTEAD OF DUST FOR DILUTING PARIS GREEN IN MALARIA CONTROL*

By PAUL F. RUSSELL
FRED. W. KNIPE
and
T. RAMACHANDRA RAO

IN another report (Russell and Jacob, 1939), one of us referred in passing to the use, at our field station, of a dustless method of diluting Paris green based, with modifications, on that recommended by Barber *et al.* (1936). After two years' successful experience with this modified procedure in Pattukkottai taluk, we believe a report may be useful, for the measure appears to us to have great value in India.

Technique

First, the following stock suspension was prepared :—

Stock suspension

Kerosene oil (Elephant brand—Socony)	.. ..	400 c.c.
Paris green	.. ..	200 c.c.
Egg albumin, dry, powdered, commercial	.. ..	1 gramme†

The above ingredients were added, in the order mentioned, in a Winchester bottle holding 3 litres and thoroughly shaken. (The total volume will be found to be 480 c.cm.) For convenience, separate tins of definite volume were used for measuring out kerosene oil and Paris green. The latter can be measured easily in a tin and, if quite dry, can be poured. The stock suspension must be thoroughly shaken every time some has to be poured out. (No water for mixing with egg albumin is being used, as after repeated tests it was found that it tended to make the stock suspension coagulate so that it was then impossible to keep the Paris green floating.)

In the laboratory, a number of glass vials—shell vials, 4 inches × 1 inch, with rims and

*This note is based on some routine studies of malaria investigations, a project under the auspices and with the support of the International Health Division of the Rockefeller Foundation co-operating with the Health Department of Madras Presidency and the Pasteur Institute of Southern India, in Coonoor, Nilgiris.

† Egg albumin is not mentioned in the original article but was suggested to us verbally by Dr. Rice as having been found useful. We agree that it is.

(Continued from previous column)

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supplied with corks—were each filled with 25 c.cm. of the stock suspension, the bottle being vigorously shaken at each pouring. These filled vials were then ready for use in the field, to which the spraying coolie took the following equipment (*see* figure) :

Fig. 1.—Coolie equipped to spray Paris green by dustless method. Carrying Hudson sprayer, tin dipper and funnel, 'cartridge' belt of vials containing stock suspension. Photograph also shows type of canal edge successfully treated by this method.

Field equipment

20 to 25 filled vials.
One khaki belt 4 to 6 inches wide (cartridge belt type). This was made with khaki drill by a tailor, and had individual pouches to hold vials.
One tin can measuring out exactly 1,000 c.cm. When not in use this was hung on a hook or a flap of the belt on the left side.
One tin funnel fitted with a wire gauze sieve.
One Hudson Sterling no. 115 sprayer.

The spraying coolie, with the above field equipment, proceeded to the breeding places and carried on as follows :—

Field procedure

1. Removed the pump from the sprayer.
2. Took 2 litres of water from the breeding place and poured it into the sprayer tank, filtering it through the funnel to remove any floating matter.
3. Removed one vial from his belt, vigorously shaking it and then pouring the contents into the sprayer tank. Taking a small quantity of water into the empty vial, it was again shaken and poured into the tank to remove the last of the Paris green.
4. Poured three more litres of water from the breeding place into the sprayer tank as before. (This brought the total water used to 5 litres for every 25 c.cm. of stock suspension.)
5. Replaced the pump plunger and pumped to desired pressure.
6. Then slung the sprayer on his back and proceeded to spray, ordinarily keeping the nozzle 1 to 1½ feet above the water surface.

The sprayer tank was kept agitated now and then with a few swings of the hip. Ordinarily 700 to 900 square feet were sprayed with 25 c.cm. of stock suspension and an average South Indian workman used between 20 to 25 vials a day.

Use in Senjayakollai

This method was used in Senjayakollai as one phase of a control programme by minor engineering methods in that village. First season's spraying began on 15th July and ended on 5th December, 1938. The interval between treatment was 4 to 5 days from July to 5th November and thereafter 7 days. The unusually short interval allowed at first was due to the observation that *Anopheles culicifacies* larvæ were developing at the rapid rate of one stage per day. The following breeding places were treated :

	Length (yards)	Area sprayed (square yards)
Branch irrigation canals ..	2,350	1,830
Irrigation channels ..	5,195	1,730
Tank edges	..	660
Borrow pits	..	2,500
Wells (120 sprayed) ..	..	94
Total area sprayed per time	..	6,814 (approx.)

There were 33 spraying rounds during the period and our record of the number of vials used was 1,818 for 31 rounds, or an average of 58.6 vials per round. This means that approximately 107.7 square yards or 969.3 square feet were covered per vial. (We estimate that the width of sprayed area along a canal bank was 1 foot.)

During 1939, spraying by this method was carried out from 7th August to 25th December at intervals varying, as in 1938, from 4 to 7 days. In 1939 only field channels and ditches were sprayed. (In neither year were the extensive rice fields around this town treated.) The total length sprayed per round in 1939 was 5,305 yards and area sprayed was estimated at 1,768 square yards. There were 32 rounds of spraying in which a total of 629 vials was used. The approximate average area sprayed per vial in 1939 was 76.8 square yards or 691.2 square feet, somewhat less than in 1938.

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Discussion

As to quantity of stock suspension required, this will of course vary with types of place being sprayed. From some special field trials, we believe it is probably safe to say that an average of 500 square feet can be covered per vial in general use. This is about 60 square feet per cubic centimetre of Paris green. Our figures were higher, but we were usually dealing with canal edges. We frequently check our results, since all our work is on an experimental basis, and we are certain that this measure was effectively controlling breeding in the places sprayed, frequently even in the presence of considerable vegetation.

Several tests of the method were made, with careful larva counting before and after. In every case the test showed excellent results. One such test may be mentioned as an example. On 7th April, 1940, in a newly-made roadside drain, 85 feet × 3¾ feet, there were 12.7 anopheline larvæ, all stages, per standard dip. One pupa was found in the course of the dipping. Vegetation was scanty. This ditch was sprayed by the above technique in the usual way. Twenty-four hours later the ditch was again sampled by standard dipping but not a single larva was taken. One pupa was found and some freshly-laid ova. In an adjoining ditch, where no spraying was done, numbers of larvæ per standard dip were the same before and after the experiment. These results agree with other tests at other seasons and in other types of breeding places.

Costs

Average expenses may be figured as follows for one day's spraying by our coolie of approximately 12,000 square feet, using 24 vials of stock suspension.

Recurring expenses

	Rupees*
Kerosene 500 c.c. at Re. 0-11-6 per gallon ..	0-1-3
Paris green 250 c.c. at Rs. 70 per 100 lb. ..	0-8-10
Egg albumin 1 gramme at Rs. 42 per 10 lb.	0-1-3
Cost of 750 c.c. stock suspension ..	0-11-4
Coolie, 1 day at Rs. 9 per month ..	0-4-9
Cost of 1 day's spraying	1-0-1

Initial expenses

	Rupees*
Hudson Sterling sprayer (115) ..	30-0-0
Spare parts	2-0-0
Vials .. .. .. (approx.)	8-0-0
Belt .. .. .. „	2-0-0
Funnel, tins, etc. .. .. „	3-0-0
Total cost for equipment	45-0-0

*A rupee at present rate of exchange may be taken as equivalent to £0-1-6 or U. S. $0.32. One rupee contains 16 annas and each anna 12 pies. Prices have risen due to war conditions. These are pre-war actual figures.

Footnote.—Some useful figures:—
100 c.c. Paris green weigh 142 grams or 0.313 lb.
100 c.c. Egg albumin (powdered) weigh 53 grams.
1 Imp. gallon kerosene oil = 4,564 c.c. equivalent to 1.2009 U. S. gals.
1 pound (avoirdupois) equals 454 grams.

Equipment should be good for at least two years, and the sprayer for considerably longer period if properly used. One might reasonably add As. 2 per day for depreciation and say that (at pre-war prices) one can treat effectively 12,000 square feet by this method per day using one coolie at a total cost of Re. 1-2-1 per time.

Summary

Using a modification of the dustless method of diluting and spreading Paris green recommended by Barber *et al.* (*loc. cit.*), we have had excellent results, especially in treating irrigation canal and channel banks, during two seasons in south-eastern India. It is our belief that the method is effective, cheap, and simple.

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A Mirror of Hospital Practice

BANTI'S DISEASE ?

By PRAN NATH CHHUTTANI, M.B., B.S. (Punjab), D.T.M. (Cal.)
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IN view of the case report of Banti's disease by Captain J. W. D. Goodall, I.M.S., in *I.M.G.*, July 1940, it may be of interest to record the following case :—

A Pathan farmer, aged 35, coming from Ghazni (Afghanistan), sought admission to the Mayo Hospital, Lahore, on 22nd December, 1938, to have his enlarged spleen removed.

History.—Twelve years before admission patient had noticed a mass under the left costal margin which he soon came to learn was his spleen. It had been steadily increasing in size all these years. Though for the first three or four years after this incidental discovery he was quite fit and without any other symptoms yet after this period he insidiously started feeling below the mark and would get attacks of epistaxis occasionally, to start with in the hot summer months only. The severity of these attacks was variable, the amount of blood lost being from a teaspoonful to about a cupful. At the same time he began to have attacks of intermittent fever which lasted for about a fortnight at a time and recurred every four or five months. Epistaxis and fever as above had been with him for about eight years before admission. He never had hæmatemesis or any other hæmorrhages. As the indigenous treatment did not benefit him and as he now also got breathless at work he left his country to have his enlarged spleen removed.

Family history revealed nothing relevant.

Physical examination.—General examination revealed anæmia; tongue and nails pale; no icterus; nothing abnormal in the circulatory and respiratory systems; spleen enlarged below the umbilicus. Consistency hard. In the middle of the palpable portion of the anterior border of the spleen there was a vague swelling about the size of an orange. Liver not palpable. No signs of ascites. No œdema.

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Laboratory investigation.—Normocytic hypochromic anæmia. There was eosinophilia of 12 per cent but no cause could be discovered. Stools showed no helminthic or protozoal infection. Wassermann reaction was negative. Preliminary and subsequent blood reports have been tabulated. Urine was normal except for presence of urobilin.

TABLE

	Date			
	14th January, 1939	2nd March, 1939	15th March, 1939	15th April, 1939
Hæmoglobin (Tallqvist method)	65 per cent	..	70 per cent	80 per cent
White blood cells per c.mm.	8,125	16,000	11,375	8,750
Red blood cells per c.mm. ..	3,560,000	..	2,850,000	3,960,000
Polymorphonuclears ..	54 per cent.	73 per cent	70 per cent	34 per cent
Lymphocytes	32 „ „	6 „ „	14 „ „	42 „ „
Large mononuclears ..	2 „ „	3 „ „	0	0
Eosinophils	12 „ „	18 „ „	16 per cent	24 per cent
Size (Eve's halometer) ..	7.3 μ	..	8.2 μ	7.8 μ
Bleeding time	2 minutes	..	1 minute 30 seconds	..
Coagulation time	4 minutes 45 seconds	..	4 minutes 15 seconds	..
van den Bergh reaction ..	Negative in all phases	..	Indirect only ++	..
Platelet count	Did not contra-indicate splenectomy, exact count misplaced.	..	160,000 per c.mm.	..
Reticulocyte count ..	..	..	3 per cent	2 per cent

Patient was sent back to the surgical ward with the visiting physician's opinion that though there was no indication for splenectomy yet there was no contra-indication for the operation. The patient was put on iron and ammonium citrate—90 grains a day—on 15th January, 1939, and ultimately, on 21st February, successful splenectomy was performed. There were no adhesions around the spleen and removal was easy. There was about a pint of effusion in the peritoneal cavity. Liver was markedly shrunken. It was the agreed opinion of everybody that its size was not more than one-eighth of normal. It had the characteristic hobnailed appearance. Recovery after the operation was interrupted by the development of broncho-pneumonia. Operation wound healed normally. He was referred back to the medical ward on 14th March when his respiratory complication had considerably improved. His blood report on 15th March showed macrocytic hyperchromic anæmia (*see* table). van den Bergh—indirect was ++. Conjunctivæ bore obvious icterus. Patient was put on intensive campolon therapy and subsequently his blood picture and general condition much improved and he was discharged on 17th April, 1939.

Point of interest.—Advanced hepatic cirrhosis as seen on the operating table was surprising in view of absence of any definite clinical indication.

Discussion.—1. Can such a case be labelled Banti's disease? There was no leucopenia. There was history of repeated intermittent fever but it started after obvious enlargement of spleen had been there for four years. There was no definite evidence of malaria either—no malarial parasites could be found. (Patient did not have any fever during his stay in the hospital except that due to the post-operative complication of broncho-pneumonia.) Personally I feel a diagnosis of Banti's disease is justified.

2. Was splenectomy justifiable? In view of the advanced cirrhosis this seems questionable.

Acknowledgment.—I wish to thank Lieut.-Colonel A. Chand, I.M.S., visiting physician and Professor of Medicine, Mayo Hospital and Medical College, Lahore, for so kindly permitting me to report this case of his which I had the chance to study when working as a house physician of his medical unit.

SEVERE HÆMATURIA RESULTING FROM THE USE OF M.&B. 693

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A FEMALE child, aged 6 years, was attacked with slight fever on the 2nd July, 1940. Her temperature came down to normal next day. But it rose to 102.5°F. at night and came down to 99°F. on the following day (4th July). Malignant tertian malaria parasites were found in the blood and 6 grains of quinine bihydrochloride were injected intramuscularly. Another injection of quinine was given in the same strength on the 5th July. But in spite of these injections the temperature was oscillating between 100°F. and 102.5°F. On the 7th and 8th July two more injections of quinine, 6 grains each, were administered. The fever did not yield. Bowels were constipated and moved by calomel and salts in the early stage. Later on, the child had occasional loose foul-smelling motions. Urine was very scanty during 24 hours. Pulse rate varied between 108 and 120 per minute. No abnormality was found in the lungs.

Urine.—Reaction—acid. Chemical examination—phosphates present. Microscopical examination—pus cells, epithelial cells, organisms—Gram-negative bacilli (*B. coli?*), diphtheroids, Gram-positive cocci in pairs and chains.

Stool.—No evidence of dysentery or helminth infection.

Progress.—The fever was irregular (99° to 102°F. axillary temperature). Hexamine was tried for three consecutive days from 11th to 13th July, to disinfect the urine, but it did no good. Four tablets of M.&B. 693 were given daily from the 17th to the 19th July. After three days of sulphapyridine treatment the child passed about 4 ounces of dark blood during micturition at 5 a.m. on 20th July. The specimen was sent to the laboratory and the report showed this to be hæmaturia and not hæmoglobinuria. The hæmaturia was thought to be due to the

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toxic action of M.&B. 693 which was stopped immediately. Plenty of fluids and big doses of alkaline mixture were given. The child had intense pain in her lower abdomen and 5 hours later she again passed about 6 ounces of red-coloured urine. Tincture hyoscyamus was administered with alkaline mixture to relieve the spasmodic pain. Next time, she passed clear urine during defæcation. The hæmaturia took place on the 18th day of illness when the child was very devitalized owing to prolonged illness.

Another specimen of urine was sent to the laboratory for examination on the 21st July. Reaction—slightly acid, albumin—*nil*. Microscopical examination—red cells numerous, pus cells, epithelial cells—present, organisms—scanty, *B. coli*—present, few.

Lastly, the patient was given *B. coli* vaccine (P. D. & Co.) with steady improvement, the temperature gradually coming down to normal on the 6th August, 1940.

The case is of interest on account of hæmaturia apparently caused by the toxic action of M.&B. 693.

My thanks are due to Dr. Baird, the group medical officer, for his kind and valuable help in the treatment and to Dr. S. K. Sen, in charge of the Nagrakata Central Laboratory, for the pathological reports.

A CASE OF AIR EMBOLISM AS A RESULT OF ARTIFICIAL PNEUMOTHORAX TREATMENT

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AIR embolism is a very rare but a very serious complication of artificial pneumothorax treatment. It occurs most frequently during the induction of pneumothorax, though cases have been recorded in which it occurred during a refill by the needle entering and tearing an adhesion. There are four possible methods by which air may enter the blood stream and cause embolism :—

(1) Air may be injected into a pulmonary vein owing to faulty technique.

(2) Air may be sucked into a pulmonary vein from the tubes and the manometer, there being negative pressure in these venous channels.

(3) The production of an air pocket under pressure may tear a recent adhesion and open up a venous channel in it, which may absorb the injected air. In such a case embolism may occur some time after the induction.

(4) If the needle should penetrate an adherent lung, the movement of the lung, with respiration, across the needle point might cause the needle to open a venous channel to the air of an alveolus or a bronchiole, from which, if it keeps open long enough, it may absorb large quantities of air.

Air embolism, though the most dangerous complication of artificial pneumothorax treatment (AP), is so rare, that we suggest the advisability of different workers recording the details of all cases of air embolism so that it may be possible ultimately to establish which of the above is the commonest cause. Only a proper comprehension of the causes will lead to the devising of proper methods to check this serious complication. The following case, which clearly illustrates what the cause was in this particular patient, is being published with this intention. This is the first case that we have had during the last four years during which period some thousands of AP fills, including some hundreds of primary fills, were given :—

A female, about 40 years of age, was admitted into the tuberculosis wards as a case of pulmonary tuberculosis. Artificial pneumothorax had been started on her left side at some other centre. An *x*-ray skiagram of the chest however revealed that the disease was bilateral, involving the whole of the upper lobe on the left side, and showing many foci of infiltration in the right upper and middle lobes.

It was decided to keep a selective collapse on the left side but also start a collapse by AP on the right side, and then maintain a bilateral selective collapse. However, before this could be done, she developed a small quantity of pleural effusion on the right side, and a high temperature as a result. After the acute stage passed off, it was decided to withdraw the effusion and replace it by air. Only a few ounces of clear fluid could be removed, but a needle passed a few interspaces above, showed the pleural cavity to be adherent there and no air was given. Next morning an attempt at AP was made again. After properly anæsthetizing the tissues by 1 per cent novocaine, the pneumothorax needle was passed. The manometer failed to show any movement, and we were going to take out the needle, when the patient began to shout and cry aloud that something serious had happened. The needle was at once taken out. No air had been given because there had been no movement of the manometer. The patient continued crying aloud, and complaining of tingling and numbness all over the body, but more on the right side. She expectorated about one ounce of bright red frothy blood immediately after the needle was taken out.

As the patient was known to be very hysterical, it was at first thought that she had developed a hysterical fit. She however soon became semi-conscious, could not recognize anybody, and tossed about continuously in her bed. An examination of the nervous system revealed an exaggeration of deep reflexes all over the body, a positive extensor plantar response on the left side, and loss of abdominal jerks on the left side. It became clear by now that air embolism had occurred involving probably the cortical area on the right side. Examination of the heart revealed no abnormality in the sounds.

She gradually became completely comatose and began to show signs of complete hemiplegia on the left side. The face was drawn to the right side, both the pupils were dilated; the left was wider and completely inactive to light reflex and while she showed occasional automatic movements of the right side, the left side was completely immobile and flaccid.

This state of affairs lasted for many hours. The next morning she was found to be slightly better. The pupils were less dilated and both were reacting to light. She was partially conscious. The left side was still paralysed, but no longer flaccid. The knee and the ankle jerks on this side were exaggerated and the plantar response was extensor. She however soon became restless and violent, tossed about in her bed, was delirious and talked incoherently all the time. The physical signs remained unchanged. This state lasted

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for three days. During this period there was complete insomnia and the ordinary hypnotics failed to give any relief. On the third night, the house physician on night duty gave her a dose of chloral hydrate at about 9 p.m. and ʒii of paraldehyde per rectum at midnight. As both these failed, he gave 1/6th gr. of morphia at 4 a.m. She went to sleep at about 12 noon, continued sleeping till about 4 a.m. next morning and woke up quite calm, and in her senses. The paralysis began to pass off gradually and had almost completely disappeared in another four or five days.

The case is obviously one of air embolism—probably involving the cortical area on the right side, though exact localization was not possible, as so long as the delirious state lasted complete examination of the nervous system could not be done. This case, however, presents certain peculiar features. No air was given and hæmoptysis occurred at the start of the symptoms. It may be argued that there might have been some sucking of the air from the tubes and the manometer by some pulmonary vein. In that case there should have been some movement of the manometer, but there was none. Hæmoptysis however gives the clue. It seems that the needle passed into the lung substance, ruptured some pulmonary vein, and the open vein, owing to the negative pressure in it, absorbed large amounts of air from the ruptured lung alveoli or bronchioles. Many workers have put forward the view that this is the predominant if not the sole cause of air embolism in artificial pneumothorax cases. This case proves that this is certainly one of the causes. This fact is, in our opinion, of practical significance in one important aspect. If this view of air embolism be accepted, we should use even for primary fills thin needles rather than the usual thick blunt needles, so that the tear in the vein when it does occur may not keep open. Moreover, there would be no use employing special gases like oxygen or carbon dioxide for the primary fills as is the practice in some centres.

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A CASE OF ABDOMINAL PREGNANCY

By (MRS.) S. MOZUMDAR, M.B. (Cal.), F.R.C.S. (Eng.)
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A PATIENT was admitted into the hospital on 6th April, 1940, for an abdominal tumour. The history was that about 13 months ago she thought she became pregnant and had all the signs and symptoms of pregnancy to the end of full nine months. She seemed absolutely certain on the point of fœtal movements, but not much faith was put on her statements, as so often the observations of these village women are inaccurate and therefore misleading. At the end of nine months, when nothing happened, she went to a hakim who gave her some 'strong' medicine and her abdomen started shrinking. From the size of a full-term pregnancy, the tumour had reduced to that of about seven months. But finding that it did not reduce any further, she sought the aid of the hospital.

Examination.—The patient was of an average build, middle-aged, had six children, was slightly anæmic, and debilitated. There was a hard, painless, lobulated tumour in the abdomen, rising well above the umbilicus; a much larger lobe on the right side, separated by a groove from a smaller lump on the left. The mobility was fair but not too free. There was no thrill and no sign of inflammatory trouble. The tumour was taken to be a uterine fibroid, with a possible left parovarian cyst added on (the left lump was in fact a parovarian mass, as it turned out on operation). The patient having agreed to a laparotomy, I opened the abdomen under spinal anæsthesia on 18th April. Directly on opening the peritoneal cavity, I found some dark reddish-green fluid in the abdomen, and a fully-formed full-term fœtus lying free in the abdomen. The larger right lobe of the tumour was the curled up and twisted fœtus, and the left lump was the rolled up, smoothed-out placenta, implanted on the original site of ruptured left fallopian tube. The fimbriated end of this tube was clearly seen while examining the specimen after the operation, so that it was not a case of tubal abortion—but one of tubal rupture, as the placental mass was implanted about midway down the length of the left tube. The ovary also was intact on this side; the whole fœtus, with cord and this implanted placenta, was removed *en bloc* by resection of the left tube near the uterine end. Fortunately, in this case, the placental implantation was on a small compact smooth surface—and was not adherent to any other organ in the abdomen, which is so often the case, leading to severe hæmorrhage on trying to remove the placenta.

The patient made an uneventful recovery.

The interesting part of the case is the very correct and accurate history given by the patient, which was not taken seriously by us as so often their histories are misleading, specially with regard to pregnancy and fœtal movements.

During convalescence, the patient was questioned again regarding the pain, etc., during the time of the tubal rupture—but it was all negative. Evidently, here was a case of very gradual stretching of the tube and escape of the fœtus into the abdomen in a 'genteel' manner, without any of the violent symptoms of an acute abdomen.

The patient left the hospital on the 26th day.

A CASE OF SELF-OPERATION FOR VENTRAL HERNIA

By M. M. D. CHUGHTAI, M.B., B.S., M.R.C.S., L.R.C.P., L.M., D.T.M. & H., D.P.H., D.O.M.S.
Divisional Medical Officer, North-Western Railway, Quetta

A PATIENT, Anglo-Indian male, apparently intelligent, aged about 48 years, a railway shed man, was brought to hospital for admission on 6th June, 1940.

History.—The patient had had a ventral hernia about the size of a big orange for the past six years. On 2nd June, 1940, he cut the protruding part with a sharp pair of scissors, sutured the skin with an ordinary needle and thread, and carried on his usual routine of life. He stated that he sterilized the instruments by boiling and washing his hands. On the morning of 6th June, presuming that the wound had healed, he took out the stitches. Soon after, he had a fit of coughing and the wound gave way. A part of the intestines gushed out but he kept them back with the pressure of his hands.

Condition on examination.—There was a transverse wound about 4 inches in length through all the layers including the parietal peritoneum at the level of the umbilicus and nearly half of the small intestines was protruding out of the abdomen. General condition of the patient, however, was fairly satisfactory. The gut remained exposed for about 15 minutes.

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Treatment.—The patient was immediately anæsthetized and the gut pushed back into the abdomen with great difficulty. The peritoneal cavity was closed. The two recti were approximated and sutured, and the abdominal wall closed. Drainage was maintained through a small tube which was removed after 48 hours. The patient developed slight temperature which was suspected to be due to sepsis and was accordingly treated with Bacteramide injections.

The patient was discharged after three weeks and is doing his usual duties with a protective bandage.

I am indebted to Dr. S. C. Chatterjee, Chief Medical and Health Officer, North-Western Railway, Lahore, for giving me valuable suggestions and permission to publish these notes.

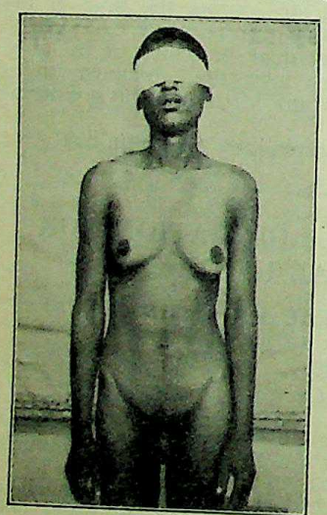
DEVELOPMENT OF SOME FEMALE SECONDARY SEX CHARACTERS IN AN ADULT MALE

By P. N. GHOSE, M.B.

Medical Officer, Kanknarrah Jute Mills, Kankinara

MR. X, Hindu, male, aged 24 years, married at 18 years and had got a male child of 2½ years age. He says at 21 years of age, *i.e.*, about three years ago, his breasts started to develop, and at present they are fairly big in size. The lumps inside get periodically swollen and become painful, but there is no secretion up till now. He says since his breasts started developing his voice is becoming sharper, and his penis and testicles are getting smaller. His sexual desire is intact all along.

On examination Mr. X looks a thin-built young man, with a narrow chest and a rather broad pubis, with scanty development of hair on his face. His voice is rather sharp and more like a female than an adult male. His breasts are fairly big in size. The left one is bigger than the right. There are dark pigmented areola with thick pigmented nipples. On palpation there are definite glands with ducts and they are tender on pressure.



The external genitals are those of an adult male type. The two testicles with cords are there. The penis and the testicles are rather smaller than the average size. There is no abnormal opening anywhere around the perineum.

The case is under observation for further development.

AN UNUSUAL CASE OF ANAPHYLAXIS

By R. M. LLOYD STILL
MAJOR, I.M.S.

Civil Surgeon, Myitkyina, Rangoon

and

B. BHATTACHARJEE, M.B., B.S. (Rangoon)

Civil Assistant Surgeon, Myitkyina, Rangoon, Burma

On 25th November, 1939, one Dr. A received an injection of anti-tetanic serum 500 units, for a shoe-nail bite on his heel. Almost at once he developed the following symptoms and signs:—

(1) *Symptoms.*—Severe constricting pain across the chest, inability to breathe properly and giddiness.

(2) *Signs.*—Cyanosis of the face, urticarial eruptions all over the body and weak pulse leading to a complete collapse.

Realizing that he was having an attack of severe serum sickness, adrenalin 1/1,000 1 c.cm. was given subcutaneously and artificial respiration was carried out for a short time. He recovered from the acute symptoms within half an hour but felt very weak and giddy. This feeling of constriction across the chest continued throughout the day but with diminished severity. He was given calcium lactate gr. x, three times a day. He passed a restless night.

On 26th November he complained of distension of his upper abdomen with feeling of nausea and belching. He gave himself a double dose of Seidlitz powder to relieve his distension. During the course of the day he did not pass a motion or any flatus and there was no relief of his abdominal distension. A turpentine enema was given with no result. By the evening the distension was accompanied with severe colicky pain in the upper abdomen. Pituitrin 0.5 c.cm. gave him no relief and morphia ¼ gr. with atropine was given to relieve him and induce sleep.

On 27th November he was transferred to the civil hospital, Myitkyina.

He was a well-nourished man of 28 years.

Past history.—(*a*) Two years ago when he had received an injection of anti-tetanic serum, he had an attack of urticaria which had yielded to treatment with adrenalin.

(*b*) History of amœbic dysentery when he was a student. During that time had had a full course of emetine.

A complete physical examination was done on admission and the findings were as follows:—

Pulse—104 per minute, temperature—100°F., respiration—26 per minute. No anæmia, no jaundice, no enlargement of glands. Tongue—coated, furred but moist. Gum and teeth—normal. Abdomen: Inspection—moderate distension of upper abdomen. Moves freely with respiration. Palpation—no definite rigidity was present anywhere but tenderness and guarding of the muscles on deep pressure were discovered in both the hypochondriac areas. There was no localization of tenderness.

Liver and spleen were not palpable.

Percussion—tympanitic resonance found all over abdomen. Auscultation—intestinal gurgling noises could be heard in all the four areas of the abdomen. Heart and lungs—nothing abnormal detected. Jerks and superficial reflexes were normal. Rectal examination showed no tenderness in the appendicular area.

The following treatments were given:—

(1) Pituitrin 0.5 c.cm. was injected and half an hour after a flatus tube was passed. There was no result. A turpentine enema was given with return of clear fluid and no result.

(2) He was placed in Fowler's position and turpentine stupes were given four hourly.

The pulse rate, temperature and the rate of respiration were recorded hourly.

The following examinations were done that day:—

(1) Blood for malaria parasites, with negative result.

(2) Blood for total and differential counts with the result: Polymorphonuclears—87 per cent, lymphocytes—8 per cent, large mononuclears—4 per cent, eosinophils—1 per cent, basophils—*nil*.

Total white blood corpuscles—12,000 per c.mm.

In the afternoon the distension was causing him intense discomfort and pain and he became very restless. The pulse went up to 118 per minute, respiration 28 and temperature 101°F. A stomach wash with sodi bicarbonate a drachm to a pint was given with immediate relief. It may be mentioned here that from the 25th the patient had taken nothing by mouth and therefore rectal saline with glucose was given every four hours since admission.

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The relief after the stomach wash was only temporary because by 8 p.m. in the evening he again complained of distension. The distension again became most distressing and in the early hours of the 28th he begged to be given a stomach wash to relieve him.

Our diagnosis was one of either acute cholecystitis or acute pancreatitis, and surgical interference was considered but did not appear justified. We decided to call a surgeon in consultation. He agreed that a laparotomy was not justifiable.

On the 28th the stools were examined and found to contain Charcot-Leyden crystals. A course of emetine was commenced. Urine was examined and nothing abnormal was detected except a trace of albumin.

The temperature on the 28th morning was 99.4°F., pulse 102, respiration 24. During the course of the day, temperature and pulse remained steady. The day passed in a similar manner, *i.e.*, severe distension of the upper abdomen, relieved temporarily by stomach wash and this was done three times during the day.

A carminative mixture was given three times a day and pituitrin 0.5 c.cm. twice daily. Calcium gluconate 10 per cent was injected intramuscularly once only. He took a little ovaltine and a few sips of beef tea. Paraldehyde was given at night to induce sleep but with no effect.

On the 29th his condition was similar except that tenderness of the abdomen was localized to the gall-bladder area, but Murphy's sign was not positive. He still complained of a colicky pain starting from the right hypochondriac region and passing across the upper abdomen ending somewhere near the splenic area. The temperature went up to 102°F., pulse to 120 per minute and he showed signs of exhaustion. Urotropine grs. 10 was added to the mixture. Bismuth salicylate was given in ½ drachm dose three times a day and ephedrine sulph. was given in ½ gr. dose. Nothing gave him any real relief except the stomach wash. This too was for only a few hours giving way to severe distension, agonizing pain and restlessness.

On the 30th certain signs appeared which supported our diagnosis of acute cholecystitis, *e.g.*, icteric tinge of conjunctiva, presence of bile in the urine and definite tenderness in the gall-bladder area, where a lump was felt. Morning temperature came down to 99°F. and maximum during the day rose to 102°F. Pulse was between 104 and 120 per minute. We then gave fractional doses of calomel and olive oil an ounce at night.

But till the early morning of 1st December stomach wash had to be carried on as frequently as before and he craved for it.

On the 1st December his condition showed signs of definite improvement. The colic had disappeared and no stomach wash was required. Although the distension was still present it was no longer causing him much discomfort. The icteric tinge of the eye became more pronounced. He was put on the following diet:—

Coffee, barley-sugar, glucose water, Bovril, chicken broth and a small quantity of Benger's food. The maximum temperature was 101.4°F. He passed a lot of flatus and also had a few motions without enema.

From the 2nd December the condition progressed rapidly towards recovery and he was treated mainly as acute cholecystitis.

Comments

The case has been described in detail as this is the first of its kind encountered by the writers and no mention could be found in any textbook.

In the *Indian Medical Gazette* of November 1939, mention has been made of serum sensitiveness in families, but no such family history is forthcoming in this case.

The patient is now well and at work but states that he is unable to take any fatty food.

The final diagnosis of acute cholecystitis was of course not difficult. The problem concerns the ætiology and pathology. Our suggestion is that there was an allergic condition causing swelling and hyperæmia of the whole intestinal tract which eventually settled in the gall bladder giving rise to the signs and symptoms mentioned.

A CASE OF DUODENAL OBSTRUCTION

By RICHARD E. STRAIN, M.C.P.&S., M.C.C., M.D.
Miraj Medical Centre, Miraj, India

A WOMAN, 35 years old, was admitted to the Miraj Medical Centre complaining of sudden onset of severe pain in the right lumbar region eleven days previously; onset was noted at 4 p.m., after a big meal and while the patient was urinating. Pain was localized and so severe that the patient was carried home immediately and remained in bed until admission into the hospital. At 10 p.m. vomiting was first noted; vomitus was bile-coloured and contained only food particles. Vomiting had persisted until admission—no hæmatemesis noted. Vomiting was promptly initiated by taking food or fluids by mouth and was associated with cramping pain in the epigastrium preceded by visible, palpable, and audible peristalsis. Several bowel movements without melæna occurred after onset, the patient having had a bowel movement the day of admission described as small and hard. Dysuria without hæmaturia and associated with nocturia (two to three times) had been present several months. No chills, fever, injury, or history of digestive distress was obtainable.

Physical examination disclosed a woman with dry skin and tongue. Temperature—97.6; pulse—116; respirations—20; blood pressure—116/70. Pyorrhœa was marked. Chest, heart and lungs were normal.

On inspection the abdomen disclosed a narrow subcostal angle below which fleeting peristalsis was visible. After drinking two teaspoonfuls of water, this was immediately markedly exaggerated; the movement being from the left costal margin to the right. When the wave reached the right costal margin, gurgling was heard without the use of the stethescope. No distension was noted. Palpation disclosed extreme rigidity of the right lumbar region extending anteriorly almost to the mid-line of the abdomen. Some spasm and rebound tenderness was noted in the right lower quadrant. A flat note to percussion was noted over the lateral portion of the right upper quadrant and down the lateral side of the right lower quadrant. No definite masses were palpable.

It was thought that the patient was suffering from a perforated ulcer (localized) with some spread down the para-colic gutter and associated with partial obstruction of the duodenum or a peri-renal collection causing obstruction—the exact nature of this being uncertain.

Laboratory examination disclosed: hæmoglobin—58 per cent (14.5 gm. as 100 per cent); red cells—4,710,000; leucocytes—26,400; differential count: polymorphonuclears—90 per cent of which 20 per cent were young non-segmented or 'stab' cells; 10 per cent lymphocytes. Catheterized urine—reaction alkaline; specific gravity—1.005; albumin—one plus (basis of one to four); sugar—negative; leucocytes—four plus; red cells—one plus.

Glucose intravenously and by proctoclysis was given; duodenal intubation was started; a transfusion of 400 c.cm. of citrated blood was given. Mouth hygiene consisting of saline mouth washes alternating with Dobell's solution were started at once as a foul mouth was noted. A 'flat plate' *x*-ray of the abdomen disclosed only increased density in the right upper quadrant.

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The following morning the right lower quadrant was quite rigid; a doughy irregular mass was palpable, thought to be matted intestines, over the pubic bone and into the right lower quadrant extending to the umbilicus. Blood urea was reported at 152 mg. per 100 c.cm.; Kahn test was negative. It was thought the process was spreading, possibly owing to increased tension and gangrene, so operation was decided upon. Because of the marked lumbar rigidity and to keep from contamination of the general peritoneal cavity, the incision was placed far laterally in the right upper quadrant.

Under local anæsthesia the peritoneal cavity was opened and normal small bowel displaced. The colon was not seen. No free fluid was present. On displacing the small bowel at the mid-line and apparently just below the greater curvature of the stomach there was a black, gangrenous mass about five inches in diameter with numerous soft spots felt. A hand could be inserted posteriorly part of the way round the mass but it seemed continuous with the vertebral column. As it seemed cystic, aspiration was attempted and 2 c.cm. of dark blood was obtained. The mass was incised and two handfuls of old blood removed. Nothing could be felt in the cavity except an irregular lining wall. A drain was inserted in the area it being thought the patient had had a pancreatic hæmorrhage or a ruptured posterior ulcer, although the pylorus felt normal as far as one could judge.

Post-operatively the patient responded well; the temperature reached a peak of 99.2°F. the first 24 hours and remained normal the second 24 hours. Blood urea was reported at 160 despite a fluid intake of over 3,500 c.cm. of glucose and saline daily with a urinary output of 1,200 c.cm. The third post-operative day the afternoon temperature rose to 102; slight swelling and pain was noted over the left parotid which increased rapidly and markedly. Lugol's solution was started, 20 minims every two hours, after the technique of Leithauser and Cantor (1940) who report 23 consecutive cases so treated without a death. Despite aspiration and Lugol's solution, the patient died five days after operation and three days after the onset of parotitis.

Permission was secured for abdominal post-mortem examination. The drain inserted in the mass was well walled off by omentum and small bowel. The remainder of the abdomen was clear. The cæcum was found in the left lower quadrant—the ascending colon going to the splenic flexure; turning back upon itself without obstruction to form the descending colon. The descending duodenum was greatly dilated measuring five inches in diameter. Just medial to the right kidney was a black mass which was retro-peritoneal and by pressure upon the duodenum (which was quite securely held retro-peritoneally rather far to the right of the mid-line) had produced obstruction. All the peri-renal tissue was quite hæmorrhagic; no pus was encountered; the capsule stripped easily from the kidney; there was no gross evidence of injury or damage to the kidney itself. The renal vessels were completely bound up in a mass of partially organized blood clot a little over four inches in diameter. It was impossible to trace the original course of the renal vessels but it appeared that the original hæmorrhage must have come from one of the renal vessels, as the mass so securely enclosed them and hæmorrhage faded as this area was moved away from. The aorta appeared normal.

The pancreas, liver, and spleen were normal in appearance. The duodenum, when incised, was normal except for the marked dilatation.

This presents an interesting case of duodenal obstruction associated with a congenital anomaly of the colon; the obstruction was caused by a retro-peritoneal hematoma whose origin seems to have been a spontaneous hæmorrhage from one of the renal vessels without gross evidence of injury to the kidney. Death probably was caused by the severe parotitis, as the patient's abdomen was quite soft without distension and food in small quantities was being taken without discomfort before death.

REFERENCE

Leithauser, D. J., and Cantor, M. O. (1940). *Annals of Surgery*, Vol. CXI, p. 650.

PER-RECTUM M.&B. 693 IN A CASE OF PNEUMONIA

By S. R. LOKRE, L.M.P.

Private Practitioner, Residency Indore, Indore (C. I.)

A BOY aged seven years was suffering from high fever, rapid pulse, hurried respiration, cough with rusty sputum, and pain in the chest. Bacteriological examination of the sputum was not practicable but clinically the signs confirmed it to be a case of pneumonia in which the whole right lung was involved.

A mixture containing liquor ammonium acetatis, sodium citrate, sodium bicarbonate, aromatic spirits of ammonia, tincture digitalis, brandy, syrup tolu, and water was given four times a day. Along with this one tablet of M.&B. 693 suspended in a little water was ordered an hour after the dose but it was not retained, I tried it in milk, but the patient vomited it again. Next I tried M.&B. 693 with a nicotinic acid tablet and gave them as a paste in honey but the combination did not agree with the patient and he vomited.

Next day the patient became semiconscious and showed signs of meningism which induced me to give M.&B. 693 per rectum. I dissolved two tablets of M.&B. 693 in one ounce of milk and gave it per rectum morning and evening. They were retained. For three consecutive days I continued the process as he tolerated the drug well when given per rectum. Combined injections of transpulmin 1 c.cm., redoxon 1 c.cm. and cardiazol-ephedrin m. 5 orally were also given last thing at night.

On the fifth day with this line of treatment his temperature, respiration, and pulse settled and congestion of the lung cleared. Thereafter the patient made an uneventful recovery.

The case is reported so that others may be induced to use the rectal route when the patient is unconscious and oral administration causes vomiting.

SUB-LINGUAL GLAND CALCULI

By KAMAL NAIN, L.T.M., I.M.D.

Shahpur City

A MOHAMMEDAN female aged about 45 years, thin, came to me with a sub-lingual swelling and pain. Its duration was 15 to 20 days. She had a feeling of discomfort and pain on touch and pressure.

Examination.—There was a swelling about half an inch from the lower surface of mouth on the inner side of the cheek towards the anterior part. It was semi-soft and had a feel like an abscess. I gave her some gargle and advised her to come the next day. She felt discomfort and pain and had the swelling opened at a hospital and felt better after the tension was relieved. After three days she again came to me and wanted me to examine her as she was still getting pain. I saw a white spot in the wound and seized it with forceps and a hard nodular stone about an inch long came out. I made a thorough search and found another of similar size. After that the wound quickly healed up.

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Indian Medical Gazette

DECEMBER

THREE QUARTERS OF A CENTURY OF UNINTERRUPTED PUBLICATION

THE present number completes our seventy-fifth volume.

The first number of the *Indian Medical Gazette*, dated January 1866, appeared in a very different world from the present one. In India, Her Majesty's Government had taken over the functions of the East India Company just eight years before, and the Suez canal was nearing completion, but was not officially opened until three years later, so that the early numbers of this journal had to be carried round the Cape before they could be read in England. It is tragic that the later numbers of our seventy-fifth volume should once more have to travel the same way—but for a very different reason.

Medical Science, 1866 *to* 1940

The scientific world has undergone even greater changes since our first number saw the light of day. In 1866, Darwin's *Origin of Species* had been published only seven years, antiseptic surgery was still unknown, and Pasteur had just finished his famous *Études sur le vin*, was investigating the silkworm disease that was threatening the silk industry of France, and had not yet turned his attention to human disease. Cholera was raging in Europe, whither it had travelled overland via Egypt; the opening of the canal a few years later provided a more direct route for epidemics of this mysterious disease—mysterious in that its cause was not discovered until nearly 20 years later; subsequent epidemics took only a few months to reach Europe from their home in India, but international quarantine regulations, based on our knowledge of the cause of the disease, have changed this channel of infection into a veritable filter which protects Europe and western countries, not only from cholera but from many other epidemic diseases. The next year, 1867, Lister introduced antiseptic surgery and in this branch of medical science a new era began. An event which went largely unnoticed at the time, for its repercussions in tropical medicine could not be anticipated, occurred in 1874 when Ehrlich introduced the dried stained blood smear; six years later Laveran demonstrated the malarial parasite, but thirty-one volumes of the *Indian Medical Gazette* had been published before Ross discovered pigmented bodies (oöcysts) in two 'fawn coloured' mosquitoes (anopheles) in the small laboratory in the grounds of the Presidency General Hospital in Calcutta (September number, 1897). But meanwhile, other things had been happening; in 1873 Obermeier discovered the spirillum of relapsing fever, in 1880, Eberth isolated the typhoid bacillus and Evans—an Anglo-Indian veterinarian—discovered the trypanosome of surra, in 1882, Koch, who six years earlier had cultivated anthrax in artificial medium, discovered the tubercle bacillus, and in the following year the cholera vibrio, and in the same year Klebs discovered the diphtheria bacillus. In 1887, Bruce discovered the causative organism of Malta fever, in 1894, Kitasato the plague bacillus, and in 1897 Shiga the bacillus of dysentery. During this period Manson was working out the cause and method of transmission of filariasis, and his inspiration and suggestions undoubtedly led up to Ross's great discovery. The next century opened with the discovery of the trypanosome as the cause of sleeping sickness, and leishmania as the cause of kala-azar and oriental sore, although an unmistakable Leishman-Donovan body had been depicted in an article in the *Indian Medical Gazette* of 1885 by Cunningham who described it as the probable causative agent of the latter disease, and in 1905 Schaudinn discovered the treponema of syphilis.

The first 40 years of the life of the *Indian Medical Gazette* constituted a great age of parasitological discovery; the subsequent period saw possibly even greater advances in a variety of directions. In 1910, chemotherapy was virtually born with Ehrlich's discovery of salvarsan as an anti-syphilitic remedy. Its early triumphs were mostly in tropical medicine; although Germany had lost her colonies, paradoxically her chemists enjoyed an almost complete monopoly and at the conclusion of the 1914–1918 war a flood of synthetic preparations was released from the big German chemical factories; amongst the most successful of these were Hans Schmidt's series of pentavalent antimonials used from 1918 onwards, with such dramatic results in the treatment of the hitherto fatal kala-azar, and Bayer 205 which though over-heralded has taken an important place in the treatment of human trypanosomiasis and a more important one in that of cattle. In 1926, plasmochin appeared and four years later atebrin, the first synthetic compound that could be used in the place of quinine in the treatment of malaria (the first published report of its clinical use appeared in the *Indian Medical Gazette*, April 1932); finally in 1935, the sulphanilamide group of preparations, which were led by Domagk's 'prontosil', brought this chemotherapeutic era to what one feels, must be its crescendo, though the crescendo is still being held. Even before the war, the British and American chemists seem at last to have begun to take the initiative, and during the last few years many of the most valuable preparations have been of British origin, so that we are not handicapped in 1940 as we were in 1914.

Two other branches of medical science, endocrinology and radiology, came into being, as

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such, during the latter half of the journal's career, though foreshadowed in its earlier days, by the work of Claude Bernard (1813–1878) and Brown-Sequard (1817–1894) who formulated the theory of internal secretions, and in 1895 by Röntgen's discovery of *x*-rays. Both have made steady and at times dramatic advances throughout this period.

Finally, at the very beginning of the century, the vitamin theory was originated by Hopkins (1906) and given more definite form in 1912 by Funk. From the original three, A, B and C, the vitamins have multiplied like the traditional rabbit; vitamin D was identified in 1920, vitamin E in 1922, and since then the early vitamins have been divided and subdivided, and entirely independent ones have been added, so that they number far more than the 26 letters of the alphabet, even if the orderly labelling had been maintained. This discovery of the vitamins was not only in itself of the greatest importance, but it has had a most stimulating effect in our attitude towards that fundamental medical science, dietetics, which during the 'parasitological era' was tending to be neglected. Most of the early vitamins have been chemically identified and many have been synthesized, as also have many of the endocrines, so that if the first half of this journal's life was spent in a parasitological era, the second half must be called an era of chemistry.

Early Contributors

All these great advances and sweeping changes in medical science will be found reflected month by month in the *Indian Medical Gazette*, whilst in many instances the first announcement of an important discovery was made in its pages; in fact a very fair history of not only tropical, but modern medicine as a whole, could be written from a careful study of these seventy-five volumes. We have not made any such detailed study, but a perusal of the early volumes shows that most of India's famous medical scientists, and these have been not a few, have used the *Indian Medical Gazette* as their mouthpiece; these include such men as Vandyke Carter, Norman Chevers, Sir Joseph Fayrer and D. D. Cunningham, to mention some of the earlier ones, but the journal numbers amongst her contributors others besides those who had adopted India as their field; for example, in the number for February 1872 there is a letter from Charles Darwin commenting on a paper that had appeared a few months earlier. To Sir Ronald Ross's contributions we have already referred. Sir Leonard Rogers was an early and regular contributor. The original papers on all his important work on kala-azar, emetine in amœbic dysentery, and intravenous saline in cholera will be found here. The earliest contribution we have found was 'on the use of calcium chloride to lessen hæmorrhage during operation with an illustrative case' in the May number, 1896, and his last, on epidemic forecasts, in March 1933, 37 years later. Another famous medical scientist, also fortunately still living, who was a frequent contributor, is Sir Robert McCarrison; his first paper appeared in April 1903.

Medical Publications in India

In 1866, medical publication in India was not in a very flourishing state, though it was by no means in its infancy, for in 1825 the *Transactions of the Medical and Physical Society of Calcutta* was published (by Messrs. Thacker & Co.) at first annually, then biennially, for a short time quarterly, and later irregularly, until 1845. The *Transactions* of a similarly-named Bombay society was first published in 1838 and maintained publication for at least 50 years; according to Crawford (*History of the Indian Medical Service*) it was still being published in 1914, but we can trace no volumes since 1889, and even up to that date it had obviously not appeared very regularly. Many other medical and scientific journals were published and enjoyed careers of various length, usually short; others were announced but did not appear. An exception appears to have been the *Indian Annals of Medical Science*, latterly published by Thacker, Spink & Co., which ran for 23 years from 1854 to 1877 and overlapped the *Indian Medical Gazette* by 11 years.

In its early days, the *Indian Medical Gazette* had no serious rivals and it can claim not only to be the oldest journal in India that has maintained monthly, or even regular, publications up to the present day, but to be the oldest such medical journal in the Eastern hemisphere. Crawford, in his book referred to above, said 'the *Gazette* has been the most successful and most important medical journal issued in India' and 'now after 47 years it shows every sign of a vigorous future career'.. To-day, 28 years later, we believe that the same words could well be applied.

In more recent years many other medical journals have come into the field. In 1911, the *Indian Journal of Medical Research* was first published. This has never been in any sense a rival of the *Gazette*, but it did relieve the pressure on its space, by publishing many scientific papers which, though not entirely suitable for the general medical reader, naturally claimed the right to appear in India's leading journal.

The *Indian Medical Gazette* is an all-India publication and not in any sense local, not we sincerely believe in its outlook, in its contributors, nor in its circulation. Contributions come from all parts of India, as will be seen by a reference to recent numbers. An analysis of the 'original communications' during the current year, excluding the current number, shows that out of 153 contributions, only 65, or distinctly less than half, came from Bengal, 18 each from Bombay and Madras, 14 from the Punjab, 12 from Indian States, 8 from Assam, and 6 from the United Provinces; other British Indian provinces provided 8, Burma 2, Ceylon

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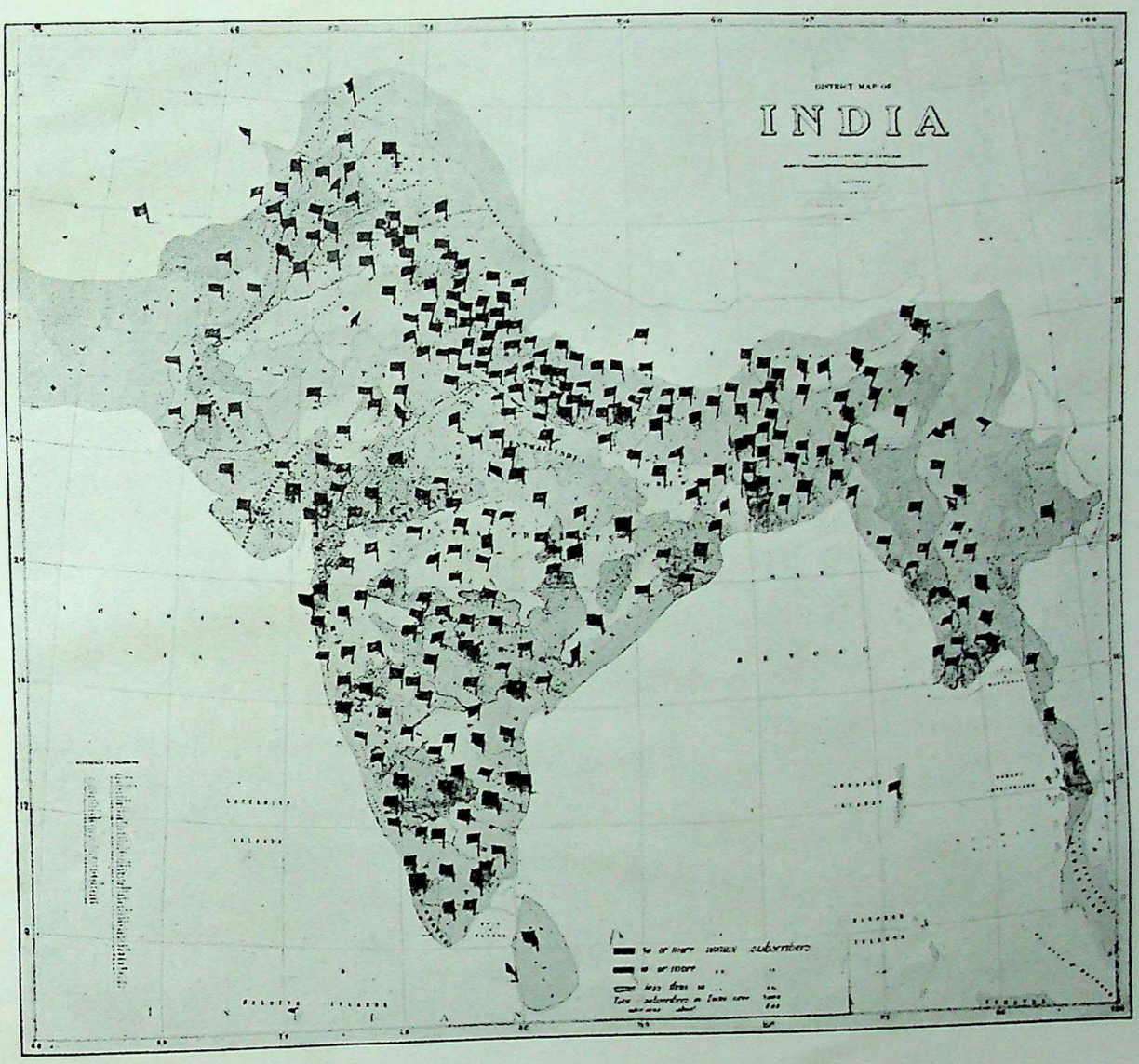
Distribution Map of

INDIAN MEDICAL GAZETTE



Photograph of a map of India which shows the wide circulation of the **Indian Medical Gazette.** In the original map the flags are coloured, red indicating 50 subscribers and green 10, and numbered; this gives a more accurate idea of the relative number of subscribers in each district, but the figures are not visible in this photograph.

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1, and Afghanistan 1. The circulation also is essentially all-India in character, as the accompanying map shows, though it has a quite considerable foreign circulation. Nevertheless, as Calcutta is thirteen hundred miles from Bombay and over a thousand from Madras, to mention two other important medical centres, it is not unnatural that medical men in these provinces should want to have their own journals. The *Antiseptic*, first published in 1904, in Madras, has had a successful career and is still appearing. In Bombay earlier ventures in the way of monthly journals have not been very successful, but seven years ago a fortnightly, the *Medical Bulletin*, appeared and is maintaining a high standard both from a literary and a scientific point of view. In Calcutta, the *Calcutta Medical Journal*, the journal of the Calcutta Medical Club, has had a successful career of 36 years, in its own sphere, as also has the *Journal of the Indian Medical Association*, first published in 1930 as the *Indian Medical World* and under its present name in 1931. An example of a specialist journal is the *Indian Journal of Pediatrics*, a carefully edited and well-printed journal, which has appeared quarterly since 1933, and as time goes on there will be room for many more specialist journals of this type, for the number of good-class contributions that are sent to us is far beyond the capacity of one journal and many have to be refused on grounds other than their scientific quality.

Many other journals of various and varying standards have appeared, and to-day the list of monthly medical journals in India must run into some dozens.

The Indian Medical Gazette

Since it was first published the *Gazette* has probably had its ups and downs, but these are scarcely reflected at all in its pages. It has shown a slow but steady expansion from the beginning; the first half dozen volumes had 20 to 24 pages in each number; in 1873 there were about 28 pages; in 1885 the number rose to 32; from 1895 onwards each number usually had 40 pages and occasionally the number rose to 48, but from the beginning of the century it appeared to fall back slightly to a steady 40, until 1922 when another advance was made to 48 and then to 52 pages; in 1928 the number rose to 60 and in 1936 to 64 pages in each issue. There has never been any suggestion that at any time contributions were difficult to obtain, nor is there any sign of 'padding'. The Indian medical periodicals of the early part of the last century, though scholarly, and often abounding in Latin quotations, usually made dull reading and consisted of little more than a series of case notes, but the *Gazette* introduced a more lively atmosphere. Admittedly case notes were numerous, but they did not predominate, and the *Gazette* was much more of a journal, on the lines of the *British Medical Journal*, its senior by just 25 years, or the older *Lancet*, than its predecessors in India had been. Changes in character have been slight and have been the direct outcome of a change of scientific environment.

The format of the first number was almost the same as the current one, and the price was Re. 1-8 for a single copy as it is to-day, but the monthly subscription was a little higher. This is not surprising, for as late as 1885 the number of annual subscribers was only 141. The first page was not unnaturally devoted to an introduction stating the aims of the paper. 'Original communications' followed, and in this first number these consisted only of seven case notes on various subjects, *e.g.*, syphilitic cirrhosis, atelectasis pulmonum, and a hermaphrodite, and a statistical statement on the treatment of tetanus in the Medical College, Calcutta. The next communication is headed 'Cases from Practice', in which four cases are reported by one writer; the distinction between this, the previous section, and a later one is not clear. The next page, 6, corresponds to our 'editorial' page and in later numbers comes about the middle of the number, as ours usually does now. The 'editorials' were on 'Professional Co-operation', which was really a request for contributions 'to satisfy the ever-craving appetite of the reading public' (the editor to-day is more troubled by the ever-increasing output of the writing public), on the cholera Congress at Constantinople, in which a demand was made that India should 'send her wise men also', on Indian medical warrants and civil pay, and on Indian ethnology, which included what we should call to-day an *open* letter from Joseph Fayrer to the Council of the Asiatic Society, suggesting an ethnological exhibition. The next section was 'Reports on Hospital Practice' (the word 'Mirror' was introduced in 1872), twelve more case reports and another statistical statement. Under the heading 'Reviews' is a long discussion, which is continued in the next two numbers, on a report on leprosy issued by the Government of India, by C. Macnamara, a frequent contributor and later editor. In this number there were no 'reviews' in the sense in which we use the word now (perhaps wrongly), but in later numbers there is a heading 'Short Notices of Recent Books' which corresponds to the present 'Reviews' section.

The next section is a very interesting one from a contemporary point of view. It is headed 'Pharmacopœia of India'. The opening paragraphs are quoted *in extenso*.

> 'The profession is doubtless aware that Dr. Waring, of the Madras Medical Service, so well known for the interest which he has always taken in the development of indigenous drugs, and for his invaluable "Manual of Therapeutics", is now in England, engaged on the part of Government, in the preparation of a Pharmacopœia for India. The following lists of Indian medicinal plants have lately been received in this country, and circulated amongst those from whom it is probable that information may be derived. With a view to give [*sic*] the subject still wider publicity, and

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to invite general co-operation, they are now published in these columns. The subject is one, financially and commercially, of the utmost importance. £20,000 are annually expended in the importation of European drugs to India, whilst the country contains effective substitutes, valuable even as simple native preparations, but which, properly prepared, might be obtained at little more than half the cost of the European importation and yield a considerable profit to speculators. To take a single instance, one of many—Gallic acid costs the state 12*s.* 1½*d.* a pound. About £80 sterling are expended annually in the supply of 130 pounds weight of the drug, which, if manufactured from mango seed, would cost about eight annas a pound; being Rs. 65, instead of Rs. 800 for the year's requirements.

We venture to indulge the hope that another septennial period will not pass away without our seeing the establishment of large chemical laboratories in each presidency—not mere repositories for the reception and distribution of imported drugs, or for the manufacture of a few tinctures, but pharmaceutical workshops on an extended scale, with highly qualified practical English chemists attached to them—men who would analyse and test the products of the country; and make preparations, of what was valuable, in the most efficient way.

Government might well initiate such a system, leaving it for completion, as they have done tea cultivation, to the enterprise of companies or of individuals. Information is solicited, meanwhile, on the subject of each indigenous product referred to in the two following lists.'

Delete the word 'English', change the figures, and this might have been written to-day. Not 7 but 70 years have passed, and we are little nearer this goal.

The first list is headed 'Principal Medicinal Plants, etc., of India', and the second, 'The Medicinal Plants, etc., of India. The Properties of which Appear Deserving of Further Investigation'. There is then a list of indigenous plants prepared by Baboo Kanny Loll Dey, this includes *Plantago ispaghula*, whose medicinal properties are described as 'demulcent and emollient. Employed with best advantage in chronic diarrhœa and dysentery, and in all inflammatory affections of the mucous membrane of the alimentary canal' (*vide* p. 733 of the present number).

The number ends with 'Extracts from European Journals' ('Current Topics' from 1880), and 'Correspondence'. In the second number the journal is obviously finding its feet for in the original communications section the case reports are replaced by original articles—on linear extraction (by C. Macnamara), the pathology and treatment of cholera, the physiological effects of quinine, etc.

Two other paragraphs from the first volume are interesting. C. Macnamara, again, in a paper in which he reports the remarkable efficacy of ipecacuanha in dysentery but complains of its 'nauseous' taste, makes the following suggestion.

'It occurred to me, therefore, that the active principle of ipecacuanha, called emetina, might perhaps be substituted for the powdered root of the plant, in the same way that quinine is given instead of bark. Since last December I have administered emetina in several cases of dysentery, and it appears to exert exactly the same effect as ipecacuanha in controlling the disease; one grain corresponds to about 20 of ipecacuanha, and it may be administered in the form of pills, or mixed with a little acidulated water.'

In the same number an editorial on cinchona alkaloids contains the following:—

'But the inquiry into medicinal efficacy of Cinchonidine, Quinidine, and Cinchonine, apart from its professional importance, is one of wide and general interest; for it bears very materially upon the extent of the success of Cinchona cultivation in India. If these principles proved to be, as supposed, even *nearly* [original italics] as efficacious as Quinine, the value of the high percentage of alkaloids in the Neilgherry Cinchonas will be considerably enhanced. If, on the other hand, their medicinal action is found to be much inferior, the commercial importance of these cinchonas will necessarily diminish in proportion. The medical officers engaged in this inquiry need hardly therefore be reminded how great a trust is reposed in their hands: upon their verdict will depend the settlement of an important medical and commercial question.'

It has been repeatedly shown that the other cinchona alkaloids are *nearly* as efficacious as quinine, yet the Neilgherry plantations were allowed to fail and the monopoly to go to Java, though the same line of argument has been used again and again in these pages and as recently as June 1938: Medical science has made remarkable advances in the last 75 years, but it has also shown a remarkable tendency to go round in circles; this is particularly the case where its natural progress has been impeded by failure of outside agencies to render it the support which it might legitimately expect.

The Editors and Publishers

The editors of the *Indian Medical Gazette* from the beginning until a few years ago were all members of the Indian Medical Service, with one exception, W. J. Simpson, Health Officer of Calcutta, who edited the journal alone for 4 years, from 1894 to 1897, though his name appears as editor in association with members of the service from 1889. The last service editor was Robert Knowles, who resigned at the end of 1932, on account of ill health. D. Boyes Smith was the first editor; he was afterwards professor of medicine at the Medical College, Calcutta, and later principal, and when he retired he became professor of military medicine at the Army Medical School, Netley.

Kenneth McLeod became editor in 1871 in association with C. Macnamara; both were apparently dynamic personalities; the former continued to edit the journal for 20 years, and even after his retirement was a regular contributor. Under his editorship the journal flourished and took up an established position in world medical literature from which it has never receded. He was followed by W. J. Simpson, referred to above, and then by W. H. Buchanan (later Sir Walter Buchanan) who except for periods of leave held the editorship for 19 years. After an intermission of 2 years during which David McCay was editor, J. W. D. Megaw (later Sir John Megaw), the director of the School of Tropical Medicine, Calcutta, took over the editorship and the journal entered on another flourishing stage of its career. The

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increased demand on its space was met by a change in type and the addition of a number of pages, which necessitated the appointment of an assistant editor, and R. Knowles was appointed in 1923; he succeeded Sir John Megaw in 1928 and was editor until the end of 1932 (*v. s.*). Since that date, L. Everard Napier, who became assistant editor in 1928, has edited the journal, and P. A. Maplestone has been assistant editor. A list of editors is appended.

At one period the names of associate editors, usually one in Bombay and one in Madras, appeared on the title page of the volume. The object was of course to give the journal a less local character; this manœuvre which was in our opinion not necessary and in practice was never a success, the associate editorship being of necessity purely nominal, was finally dropped in 1922.

The editors have always been men actively engaged in some branch of medical science, but their fields of activity have varied considerably; the first editor, D. Boyes Smith, was a Fellow of the Royal College of Physicians, as is the present one; three others C. R. Francis, D. McCay, and W. J. Simpson have been members. Boyes Smith was a professor of medicine at the Calcutta Medical College, as also was D. McCay; J. W. D. Megaw, who later became Director-General, Indian Medical Service, was professor of tropical medicine at the School of Tropical Medicine, as is the present editor; R. Knowles was the professor of protozoology at this School. Kenneth McLeod, a Fellow of the Royal College of Surgeons of Edinburgh (apparently at the age of 20) and later an Honorary Fellow of the Royal College of Surgeons of England, was professor of surgical anatomy and clinical surgery, and later of surgery at the Medical College; C. Macnamara was professor of ophthalmic surgery and L. A. Waddell, professor of chemistry at the same college. W. J. Buchanan did not hold any academic appointments; he was in the jail department and became Inspector-General of Prisons, Bengal, in 1913 and was later knighted. W. J. Simpson was, as we have said, health officer of Calcutta.

The first sixteen volumes were published by Wyman & Co., the next three by Newman & Co., and in 1885 the *Gazette* was taken over by Messrs. Thacker, Spink & Co., who have published it since. Mr. C. F. Hooper, who was first associated with the *Indian Medical Gazette* in 1891, took over the management early in this century, and did much to improve the journal and expand its subscription list.

Policy

The *Indian Medical Gazette* has no 'platform', and its only policy is the furtherance of medical science. It does not even claim any special mission in furthering the interests of the practitioners of scientific medicine, though it has these at heart, for we believe that they will further their material interests best by ever advancing their science and perfecting themselves in the application of it to the relief of human suffering. Moreover, the interests of different sections of the medical community often appear to be divergent, and it has never been the policy of this journal to further the interest of one particular section of this community, though, from time to time when special injustices appeared to exist or to be imminent, it has felt compelled to protest, but, we believe, never selfishly, for, though most of the editors have been members of the Indian Medical Service, editorial support has usually been given on behalf of the lower grades of the medical services, such as the sub-assistant surgeons. If in the past the rule of avoiding partisanship, or even discussing controversial subjects of a political nature, has occasionally been broken, this has not occurred for many years, and never, we claim, under the present régime.

We have emphasized above that the *Gazette* is an all-India journal and that its contributions come from, and its readers live in, all parts of India; similarly, in the selection and priority of contributions we show no bias in favour of any race or creed, of any service, or of the holders of any particular qualification, for the contributors are Indian, British, and foreign, members of the I.M.S., I.M.D. and provincial services, railway, tea-garden and other industrial medical officers, and private practitioners, and articles by L.M.F.s and F.R.C.P.s, by M.D.s of London, of New York, and of Patna, and, we will add, even to-day, of Hamburg, all appear side by side. If in the past the journal has enjoyed some measure of success, we feel that it is due very largely to this liberal policy.

The Future

The last twenty years have seen considerable expansion and all-round improvement in this journal, but we are not content to leave it at that. The success of a journal depends to a great extent on its editors, publishers and printers, but to a greater extent on its contributors and its readers. This journal has a wide circulation, but, with an even wider one, it could afford to add more pages and institute other improvements. This is a matter in which we ask the co-operation of our present subscribers, for their own benefit.

The *Indian Medical Gazette* can look back on 75 years of very useful life, and, if civilization survives the ordeal through which it is now passing, as every omen is favourable, we are confident that the *Gazette* can look forward to a particularly bright future.

List of Editors and Assistant Editors of the Indian Medical Gazette

D. B. Smith, 1866.
J. A. P. Colles, 1867.
C. R. Francis, 1868.
J. T. Carter Ross, 1869 to 1870.
N. C. Macnamara, 1871 to 1873.
K. McLeod, 1871 to 1892.
J. G. French, 1876 to 1877.

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L. A. Waddell, 1884 to 1885 and 1897 to 1899.
W. J. Simpson, 1889 to 1897.
A. Crombie, 1892 to 1893.
D. M. Moir, 1897 and 1903 to 1904.
C. H. Bedford, 1897.
F. P. Maynard, 1898.
W. J. Buchanan, 1899 to 1918.
D. McCay, 1909 to 1910 and 1919 to 1920.
J. W. D. Megaw, 1921 to 1928.
R. Knowles, 1923 to 1932.
L. E. Napier, 1928 to date.
P. A. Maplestone, 1933 to date.

Special Articles

HÆMATOLOGICAL TECHNIQUE

PART VI

By L. EVERARD NAPIER, F.R.C.P. (Lond.)
and
C. R. DAS GUPTA, M.B. (Cal.), D.T.M.
(*From the Calcutta School of Tropical Medicine*)

The making and staining of blood films

PROPERLY made and well-stained blood smears are essential for the white cell differential count, the enumeration of the nuclear lobes of neutrophil polymorphonuclears, as in the Arneth and Schilling counts, and also for the determination of the red-cell size by the Price-Jones' method.

For ordinary work blood films are made on 3-by-1-inch glass slides and for special studies on 2-cm.-square coverslip : only new slides and coverslips should be used if this is possible. The slide and the coverslip must be thin, completely transparent, scrupulously clean, and free from grease and dust.

Cleaning glass slides and coverslips

Place the slides and coverslips in sulphuric-acid-bichromate mixture* and allow them to remain for twenty-four hours; this mixture should be kept in a large jar for the slides and in a small one for the coverslips. Decant off the cleaning mixture into another similar glass jar, which is then ready for use again. Transfer the slides or coverslips to a shallow enamelled tray or a big petri dish, and place this under a tap for 3 to 4 hours, stirring from time to time with a glass rod. Finally, wash with distilled water, dry with a piece of soft linen, and put them in a jar of absolute alcohol for twenty-four hours (methylated spirit may be used as a substitute). With a pair of forceps take out the slides or coverslips one by one, allow the excess of spirit to drain off, flame in a bunsen or spirit lamp, clean again with soft linen, and store in a dust-proof container—in a slide box for the slides and in a small petri dish for the coverslips. These are now ready for use for all ordinary work.

* Concentrated sulphuric acid .. 500 c.cm.
Potassium bichromate (powdered) .. 100 gm.
Water .. .. .. to 1 litre

Polishing the slides

For special work, polish one side of a slide, cleaned as above, with jewellers' rouge for 2 to 3 minutes, clean with soft linen (selvyt cloth or silk is the best for this purpose), mark the polished side with a glass pencil, and store for future use in a dust-proof container.

A. Spreading the film in the routine use of venous blood

(*i*) *On slides.*—Put a few polished slides on a flat surface. With a syringe collect the blood from a vein (*vide* part I). Before putting the blood into the oxalated flask and while the needle is still attached to the syringe, put a small drop of blood on to the middle of the slide, a little away from the end. Apply the thin edge of another slide, with the corners cut off so that the spreading edge is narrower than the slide, or better still of a spreader (hæmocytometer coverslips make excellent spreaders on account of their smooth narrow edge), to the middle of the glass slide, slide it along until it makes contact with the drop of blood which will now spread along the edge of the spreader (slight lateral movement will accelerate this), then with the spreader at an angle of about 30° to 40° to the slide, push the spreader with the blood following it along the slide and raise the spreader abruptly just before the whole drop of blood has been used up. The film should be dried quickly by waving it in the air, or under an electric fan. An ideal film should occupy the middle third of the slide, should be of uniform thickness, should not have any tails, and when viewed under the microscope the red cells should just touch one another and there should not be any rouleau formation anywhere on the slide.

Fig. 1*a* shows a satisfactory film but with 'tails', and figure 1*b* a good film with a straight 'leucocytic edge'. They were drawn from above downwards. Figure 2 shows the low-power view of a satisfactory leucocytic edge; the leucocytes are actually discrete though the photograph scarcely gives that impression.

The important points are a perfectly clean slide, a good spreader, and a drop of blood of the right size; this last can only be gauged by trial and error, but, compared with the size of the drop required from a normal individual, a larger drop will be required from an anæmic patient

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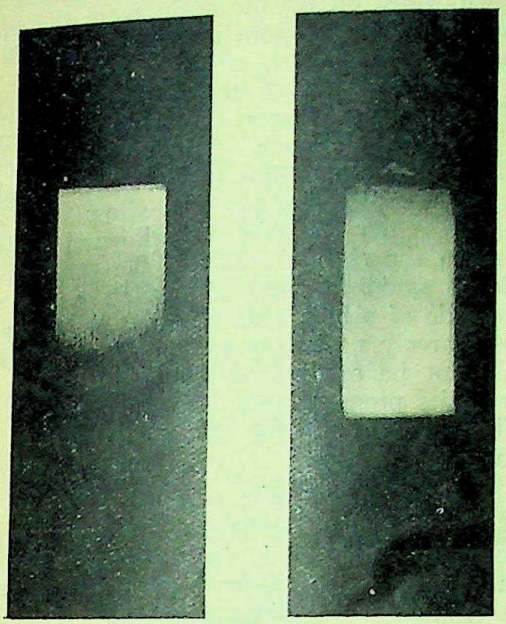
and a smaller drop from one with polycythæmia or leukæmia.



a Fig. 1. *b*

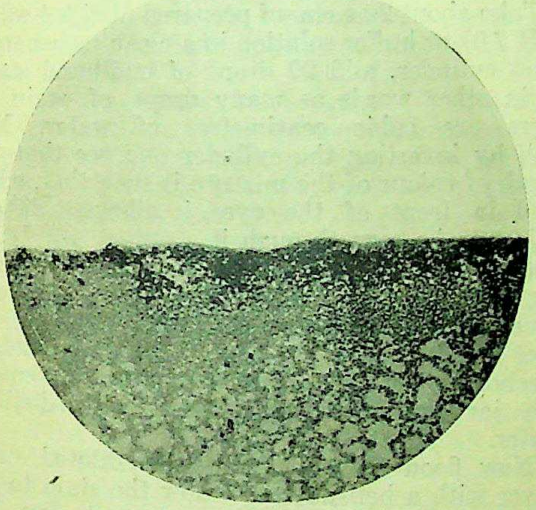


Fig. 2.

(*ii*) *On coverslips.*—Place a few clean coverslips on a flat even surface. Proceeding as in (*i*) put a very small drop of blood on the centre of a coverslip; place another clean coverslip of the same size on the top of the drop of blood in such a way that the sides of the two coverslips are not opposed (*see* figure 3). If the two coverslips are clean, the blood will spread uniformly between them. Now draw apart the coverslips quickly but gently, and dry them quickly by waving them in the air or under an electric fan.

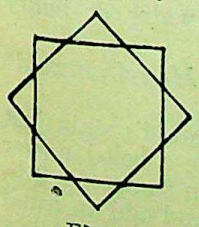


Fig. 3.

B. From capillary blood from the finger or ear lobe

Prick the finger or ear lobe fairly deeply with a sharp surgical needle or with a blood gun, so that the blood flows freely from the wound. Apply the surface of a clean slide or coverslip to a small drop of blood and proceed as in *A* (*i*) or (*ii*).

Comparing the two methods

The method of choice is in our opinion the slide smear. The advocates of the coverslip method claim that it is the only way to obtain an even distribution of cells and that consequently reliable differential counts can only be made from coverslips. On the other hand, it is much easier to make a good film on a slide, and, if the whole drop of blood on the slide is utilized in making the smear and this drop is a small one, examination of such a smear will give as reliable information as examining a coverslip smear, the preparation of which demands considerable dexterity.

Staining blood films

All blood smears should be stained within twenty-four hours. If the smears cannot be stained immediately they must be fixed with methyl alcohol and stored in a dust-proof slide box for staining at a later date. The unstained slides must never be left uncovered on the working table as blood is readily eaten by the flies during the day and by cockroaches at night.

Romanowsky stains are used for all blood work. The most commonly used stains are those originated by Leishman, Wright, Jenner, and Giemsa. All these stains depend for their action on the compounds formed by the interaction of methylene blue and eosin, and the differences between the various stains are due to the proportion of the two stains. Excepting Giemsa's stain, the fluid stains are prepared by dissolving the dry powder in acetone-free pure methyl alcohol, so that a preliminary fixation with methyl alcohol is only required in the case of Giemsa's stain. Leishman's and Wright's stains are used in the strength of 0.15 per cent, and Jenner's stain in the strength of 0.5 per cent.

Preparing Leishman's, Wright's and Jenner's stains

Stains in powder or tablet forms and extra-pure acetone-free methyl alcohol for dissolving the stains should be obtained from some reliable firm. We have found the Gürr's* stains to be very satisfactory.

All the glassware used in preparing the stains and in storing them should be scrupulously clean, and free from any trace of water; they should be rinsed first with absolute alcohol and finally with a little methyl alcohol.

Take the requisite amount of stain in powder or tablet form in a small glass mortar. Measure

* George T. Gürr, 136, New Kings Road, London, S.W.6, England.

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out the requisite amount of methyl alcohol in a graduated glass cylinder. Pour out about 2 c.cm. of methyl alcohol on the stain and grind well to make it into a thin paste. Add in small quantities at a time about half the total amount of methyl alcohol, grinding all the time. Carefully decant the supernatant dissolved stain into a clean glass stoppered bottle. Add more methyl alcohol to the undissolved stain, grinding as before. Again decant the supernatant stain into the bottle, continue the process until all the methyl alcohol is used up. If this is properly done all the stain will go into solution and no residue will be left at the end. Incubate the bottle with the stain at 37°C. for 24 hours when it will be ready for use.

A. Staining with Leishman's, Wright's or Jenner's stain

Reagents and apparatus required

1. Prepared stain, preferably in a drop bottle.
2. Distilled water (pH 7.0), or buffer solution with pH of 6.4 and made with acid monopotassium phosphate and disodium phosphate *.
3. Fresh distilled water which is slightly acid in reaction.
4. Staining rack. This can be made with plasticine and a pair of glass rods of equal size and thickness, and may be placed at one end of a sink away from the water tap, or on a rectangular enamelled tray placed near a tap.

Glass beakers, cylinders, a pair of forceps, capillary pipettes, teats, etc.

Technique.—Put the slides on the staining rack taking care that the side with the blood film is upwards; also see that the two ends of the slides are in the same plane.

From a drop bottle, or with a pipette, pour on sufficient stain to cover the whole of the film; wait for one minute to allow for proper fixing; with a capillary pipette now add distilled water (pH 6.8 to 7.0) or the buffer solution—the same volume in the case of Leishman's and Wright's stains but double the volume in the case of Jenner's stains. With a capillary pipette or glass rod thoroughly mix the stain with the diluent to ensure a uniform mixture over the film.

When the mixture is allowed to settle, a scum will form on the top, if the proportion of the stain and diluent has been correct. According to the depth of staining required, allow the diluted stain to act for 5 to 10 minutes, in the case of Leishman's and Wright's stains, and 3 to 5 minutes, in the case of Jenner's stain.

The diluted or undiluted stains on the slides must not be allowed to dry up at any stage of the staining. Drying is prevented by covering the staining rack with a wide bell-jar, or other improvised device†.

* Monopotassium phosphate .. 6.63 gm.
Anhydrous disodium phosphate .. 2.56 gm.
Distilled water .. .. up to 1 litre
Add 1 c.cm. of chloroform as preservative.

† The precaution will seldom be necessary in humid climates, *e.g.*, of Bengal and Assam, except in the hottest months, but will be imperative in drier provinces in India, and in other dry countries such as Iraq, Egypt, etc.

When the staining is complete, hold one end of the slide firmly with a pair of forceps, and place the stain-flooded slide under a running tap. This will wash off all the stain from the upper surface, while the bottom is cleaned by rubbing it well with the fingers of the left hand. The slide is now transferred to the beaker containing fresh distilled water and gently shaken to and fro till the colour of the smear becomes faintly pink. Now take it out of the beaker, wash again under the tap and allow it to dry. In order to dry it without allowing dust to adhere to the stained surface, the slide should be sloped against a vertical surface, *e.g.*, a wall or the side of a box, with the film side inwards. (It is scarcely necessary to point out that heat should not be applied to a blood film at any stage in its preparation.)

When it is dry the slide is ready to be examined.

B. Staining with Giemsa's stain

It is more difficult to prepare this stain and it is better to purchase it in solution. Giemsa's stain as prepared by Gürr is quite satisfactory.

In staining with Giemsa's stain, preliminary fixing with methyl alcohol or some other fixing stain is absolutely necessary.

Preparing dilute solution

Take about 20 c.cm. of prepared distilled water (pH 7.0) or buffer solution in a clean transparent glass cylinder, add 20 drops of undiluted stain, or in other words as many drops of stain as there are cubic centimetres of water. Mix well by inverting the cylinder and see that the depth of colour of the mixture is such that, when held in front of the eyes, it allows a distant object to be seen through it.

(*i*) Place the slides to be stained on a staining rack, flood the slide with methyl alcohol and cover with a bell-jar, so that the methyl alcohol does not dry up on the slide. Allow the methyl alcohol to act for about two minutes, remove the jar and thoroughly wash with distilled water.

Now flood the slide with the diluted stain, cover with a bell-jar, and allow the stain to act overnight. Next morning wash and dry the slide as in *A*.

(*ii*) *Combined staining with Leishman's, Wright's or Jenner's and Giemsa's*

This is done exactly in the same way as in *A* but substituting the dilute Giemsa's stain as the diluent in place of distilled water or buffer solution.

(*iii*) *Combined staining with May-Grünwald* and Giemsa*

Pour on undiluted May-Grünwald's stain just sufficient to cover the slide, place a bell-jar over the staining rack, allow the stain to act for 2 to 3 minutes, remove the bell-jar, and add an equal amount of neutral distilled water (pH 7). Allow

* This can be purchased in solution and is available from G. T. Gürr (*v.s.*).

(*Continued at foot of opposite page*)

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MAKING PLASMA SAFE FOR TRANSFUSION

By S. D. S. GREVAL
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THE intention is, (*i*) to state that it is not safe to give a transfusion of incompatible plasma, (*ii*) to suggest means of making the plasma safe, (*iii*) to indicate how stored plasma helps in transfusions, and (*iv*) to indulge in two speculations regarding the use of plasma in malignant growths.

I. Incompatible plasma

A disaster in blood transfusion, occurring with dramatic suddenness, when an error in grouping blood has been made, is due to lysis and/or agglutination of the donor's corpuscles in the recipient's body. The donor's plasma, however, is not without effect. If it has not been made ineffective by dilution with the recipient's plasma it will lyse and/or agglutinate the recipient's corpuscles. This is known to occur when a dangerous 'universal donor' has served a recipient of a group other than O. His own corpuscles are inagglutinable; the effect produced is entirely due to the action on the recipient's corpuscles of the isohæmagglutinins in the donor's plasma.

If the danger from the plasma of a subject of group O is real then the danger from the plasma of subject A for subject B, from the plasma of subject B for subject A, and from the plasma of both subjects A and B for subject AB is also real. The writer holds that the danger from a dangerous 'universal donor' is real (Greval and Chandra, 1939).

The risk from incompatible plasma would in fact be increased if the titre of sera a (from subjects B; III Jansky and Moss) and sera b (from subjects A; II Jansky and Moss) were of the same high order as that of sera ab (from subjects O; I Jansky and IV Moss). Such is not the case. On the whole the isohæmagglutinins a and b in sera a and b are weaker than in sera ab. But sera a and b of high titre are found. The writer uses only these sera in grouping tests. A simple scheme for titrating the sera and excluding the risk has been given in the communication quoted in the last paragraph.

II. Making plasma safe

Although the danger of injecting ungrouped plasma intravenously has not been plainly admitted, ideal plasma has been described and methods of making plasma (other than ideal) safe have been recommended and adopted. Plasma from subjects AB (Jansky IV and Moss I) having no isohæmagglutinins has been considered ideal (Editorial, *B. M. J.*, 1940). Bloods A and B have been taken in the same bottle to remove the isohæmagglutinins by absorption (Edwards, Kay and Davie, 1940). Plasma has been diluted with an equal volume of normal saline (Goldman, 1940; Smith, 1940). There are difficulties in obtaining the ideal plasma and in making the one other than ideal safe according to the devices mentioned. Subjects AB are scarce, absolutely, all over the world. Subjects B are scarce, relatively, in Europe and America; for every A a partner B cannot be found to fill the same bottle. Citrated plasma is likely to coagulate at times when diluted with an equal volume of normal saline and loses half its value always.

Davie (1940) who started by taking for storage, plasma from the blood of subjects of group 1 (Moss 1 or I, International AB) only now also takes it from the blood of subjects of group 2 (Moss 2 or II, International A). The latter plasma given after dilution with an equal volume of saline, without regard for the group of the recipient, is not likely to do much damage in England where the predominating groups are O and A. Besides, the isohæmagglutinin b it contains is likely to be, on an average, of a lower titre than the isohæmagglutinin a (from plasma of subjects B, Moss 3 or III) would be and may not affect an odd recipient of group B (Moss III) or AB (Moss I). Plasma from subjects of group 3 (Moss III, B) will not be so safe. In India, where O, A, and B are more evenly distributed, risk would be real. The nomenclature, outside the brackets, in this paragraph is of the original communication. The brackets give the writer's explanation and international nomenclature.

Incidentally, the risk will persist even when the plasma is given intraperitoneally or intramuscularly to an infant with a view to increasing the volume of blood in the circulatory system rapidly.

The writer recommends the following plan for selecting plasma which is safe, with respect to its isohæmagglutinin content, or making dangerous plasma safe :—

1. *Selection of safe plasmas.*—Plasma conforming to the standard of the safe universal

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(*Continued from previous page*)

the diluted stain to act for 5 to 10 minutes according to the depth of staining desired, wash thoroughly with neutral distilled water and then flood the slide with dilute Giemsa's stain to act for 15 to 30 minutes according to the depth of the staining desired, and wash and dry as in *A*.

Methods used in our laboratory

For all ordinary work Wright's staining method is used, and for special work, *e.g.*, examining smears from the marrow, counting the nuclear lobes in Arneth and Schilling counts, combined May-Grünwald and Giemsa's staining are preferred. For, with the combined May-Grünwald and Giemsa's staining, all the component parts of both mature and immature red and white cells are very well shown.

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donor (Greval and Chandra, *loc. cit.*) with respect to the titre of isohæmagglutinin a and b is safe. Plasma ab (from subjects O) is thus selected. Plasma a (from subjects B) and plasma b (from subjects A) are selected similarly. Plasma o from subjects AB is of course ideal.

2. *Mixing of plasmas.*—Plasma a and plasma b may be a trifle over double the safe strength if they can be mixed in equal volumes. After mixing and keeping a day in the cold the titre will be found to be below the arithmetically calculated titre and safe. The arithmetically calculated titre of course will be half the previous titre of each isohæmagglutinin.

In India the discrepancy between groups A and B is not so marked as in England although group B predominates slightly. In a blood transfusion centre in a big town it is possible to get both the groups in about the same number. There will be as many bottles of stored A blood as of B blood. So far as the writer's experience of the titre of the sera goes, a great majority of the plasmas a and b can be made safe by mixing.

3. *Removal of isohæmagglutinin by absorption.*—Two time-expired (over 10 days old) bottles of bloods A and B, plasma from which is not safe to begin with and cannot be made so by mixing, are taken and termed first and second bottle. A third empty bottle is added. The supernat from the first bottle is transferred to the third bottle by a sterile system of two rubber tubes, a two-way adapter and a syringe. The supernat from the second bottle is then transferred to the first bottle by the same system and mixed gently with the deposit of red blood corpuscles. The supernat removed to the empty bottle is finally transferred to the second bottle and mixed with the deposit of corpuscles. Plasmas a and b are now in contact with the corpuscles A and B which will remove their isohæmagglutinins if kept at room temperature for 15 minutes and in the cold for half an hour. The agglutinated corpuscles fall to the bottom rapidly leaving a clear supernat which can be removed and bottled. A trace of colour can be disregarded.

For complete absorption of the isoagglutinins from a volume of plasma half a volume of corpuscles suffices unless the latter are A_2 or A_3 (slow A's). For a partial removal of the isoagglutinins even a smaller quantity will do.

The operation of removals and transfers must be performed with sterile precautions; or else the absorbed plasma will have to be filtered through a Seitz filter.

The agglutinated corpuscles are still either A or B although sensitized and available for making other preparations.

Dangerous excess of a or b from a serum ab can also be eliminated by suitable absorption. The entire contents can be removed by absorption with corpuscles AB from a subject AB.

4. *Dilution of plasma.*—If the devices described under 2 and 3 cannot be used the plasma must be diluted to a safe strength *after its titre has been determined.* The diluting fluid should be 0.25 per cent sod. citrate in normal saline. The limit of safety of sod. citrate for an adult is 5 grammes.

Other dangers in plasma are those that also exist in stored whole blood. It might be thought that the danger from syphilis might be eliminated without the aid of a Wassermann test by filtering or drying plasma and thus removing or killing the spirochætes which may be present. The danger of a passive sensitization, however, brought about in a recipient by a syphilitic's blood remains: and sensitization accompanied by a subsequent assault is probably more important in the long story of syphilis than any immediate damage done by the spirochætes. The writer, therefore, does not recommend that the Wassermann test should be omitted.

Potassium ions are reported to increase in plasma when the whole blood is stored (Editorial, *J. A. M. A.*, 1939). Danger from them would be the same as the one arising from the use of the stored whole blood from which the plasma has been taken. This danger does not appear to exist. 'Data have been presented on the incidence and type of reaction occurring in a series of 1,458 transfusions of blood stored from one to thirty-eight days and 146 transfusions of fresh blood. No types of reactions were encountered that were distinctive of preserved blood' (DeGowin and Hardin, 1940). The blood had been taken in a sod. citrate solution for short storage and in a dextrose-citrate solution for long storage.

Incidentally, the plasma possesses all the advantages stored blood has over fresh blood. They are: (*i*) decrease in food and allergic reactions, (*ii*) extended observation on the state of health of the donor during an epidemic, and (*iii*) exclusion of blood of high coagulability in certain conditions (Greval, Chandra and Roy Chowdhury, 1940).

Plasma made safe by methods other than dilution can be dried for easy storage and transport. A method has been published (Davie, *loc. cit.*). On the whole, dried plasma has so far not been preferred to preserved liquid plasma. 'There was a place for dried plasma, but it could not replace plasma saline' (Davie, *loc. cit.*).

III. Help given by stored plasma in transfusions

That stored plasma has a place in the treatment of sudden loss of blood has been discussed this year by different workers from different countries (Best and Solandt, 1940; Goldman, *loc. cit.*; Smith, *loc. cit.*; Davie, *loc. cit.*; Greval, Chandra and Roy Chowdhury, *loc. cit.*). That it prevents waste in a blood bank is also worthy of remark. One important consideration when blood is taken from voluntary, unpaid, public-spirited donors is that it should be made use of. Often, in a newly started blood bank,

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blood taken for storage is limited to a bottle or two for each of groups O, A and B lest there should be no demand. Then the demand comes suddenly and there is no blood. All sudden demands can be satisfied wholly or partly by stored plasma for preparing which more bottles of blood can be taken for storage without fear of waste. Blood from group AB can also be taken, for the ideal plasma and for absorbing plasma of dangerous 'universal donors'. Ordinarily this blood is not taken.

IV. Two speculations regarding malignant growths

1. *Action of the isohæmagglutinins on malignant cells.*—An isohæmagglutinin is absorbed by all the cells of the body of a subject of the appropriate group. Will the rapidly-growing ill-formed malignant cells absorb it, become sensitized, and be adversely affected? Appropriate plasma or sera below a dangerous titre can be given intravenously. Even high-titre plasma or sera can be injected locally into the growth and applied as dressings.

2. *Possibility of replacing most of a patient's plasma.*—Normal humoral forces are probably capable of destroying malignant growths. Given a stock of compatible plasma, it should be possible to replace most of a patient's plasma in the course of a few days. The patient could be (*i*) transfused with compatible whole blood, (*ii*) bled and (*iii*) transfused with his own red blood cells and a healthy donor's compatible plasma. Steps (*ii*) and (*iii*) could be repeated. Will the replacement destroy the malignant growth?

Summary

1. Plasma may be incompatible like the plasma of a dangerous 'universal donor'.

2. Plasma stored for transfusion can be made safe by (*i*) selection, (*ii*) mixing, (*iii*) absorption and (*iv*) dilution. The Wassermann reaction should be done. Potassium ion concentration in the plasma is negligible if the red blood cells are removed in a few days. No distinctive reactions due to stored blood have been recorded even after storage lasting 38 days.

3. The separation and storing of plasma will abolish waste in blood banks.

4. There are two speculations regarding the use of plasma in cases of malignant growths: (*i*) Will the appropriate isohæmagglutinin sensitize and destroy the malignant cells? (*ii*) Will the replacement of a patient's plasma by normal healthy plasma destroy the malignant cells?

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Addendum (dated 13th November)

Since this communication was sent, a report on the preparation of serum from plasma of stored blood has become available (Clegg and Dible, 1940). The serum is preferred to the plasma because of the formation of particulate matter in the latter on standing. It has a high calcium content (six to eight times normal) and is recommended for use regardless of the group of the recipient.

The present writer makes three observations: (1) His opinion on the danger of incompatibility of groups remains unchanged. (2) The risk of producing favourable conditions for the anærobic flora, responsible for tetanus and gas gangrene, by increasing appreciably the calcium content of the tissues (Topley, 1933), needs consideration, particularly in connection with street accidents and war wounds. (3) Removal of the particulate matter from the plasma by filtering should not be difficult.

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Medical News

TUBERCULOSIS ASSOCIATION OF INDIA

TUBERCULOSIS NEWS

I. Tuberculosis Workers' Conference

THE second Tuberculosis Workers' Conference will be held in New Delhi from the 18th to 21st November, 1940. [The conference has now been successfully concluded.]

One whole day will be devoted to the discussion of the influence on the spread and development of tuberculosis of such environmental factors as poverty, over-crowding, under-nourishment and occupation of insanitary dwellings, and of the effects on the spread of tuberculosis of legislation including by-laws dealing with notification; erection of buildings, slum clearance, town planning and the regulation of lodging houses.

Other important subjects, such as tuberculosis surveys, uniformity of records of classification of patients and the results of treatment, will be discussed, as well as the interpretation of *x*-ray films and their recording. Further, a few clinical subjects dealing with the treatment of certain complications will also come up for debate.

The Conference will be opened and closed by Her Excellency the Marchioness of Linlithgow, President of the Tuberculosis Association of India.

II. Training Courses

The Tuberculosis Association of India, with the co-operation of the Bengal Tuberculosis Association, will organize a medical post-graduate course for training in

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tuberculosis at the All-India Institute of Hygiene and Public Health, Calcutta, from the 15th January to 14th February, 1941.

2. The class will be limited to 30 registered medical practitioners—male or female—whether in Government service or otherwise. Ten seats will be reserved for practitioners in Bengal Province and 20 for candidates from other parts of India.

III. Meetings

A central committee meeting of the Tuberculosis Association of India was held at the Viceroy's House, New Delhi, on the 28th October, under the presidency of H. E. the Marchioness of Linlithgow. Besides some routine matters, the following business was transacted. The committee approved the award of the Hassan Masud Suhrawardy Memorial Anti-Tuberculosis Challenge Shield for the all round good work on tuberculosis done during 1939 to the Madura Municipality which competed among 12 others. It was decided to request affiliated tuberculosis associations to send half-yearly (quarterly if possible) reports of their activities for incorporation in the tuberculosis news service of the central association. The committee also decided to proceed with the election of five members to the central committee from the affiliated associations. Finally, the committee resolved to offer to Dr. C. Frimodt-Möller, C.B.E. (Hon.), the present medical commissioner of the association, an extension of appointment by two years on the expiry of his present contract on the 30th April, 1941.

IV. Tours

Lieutenant-General G. G. Jolly, chairman of the association, went on a tour of inspection to Bombay and Karachi during the second week of October and discussed with officers of the provincial tuberculosis associations the progress of anti-tuberculosis measures.

Dr. Frimodt-Möller, the medical commissioner of the association, paid a visit to Shillong on the 8th, 9th and 10th October to advise on the best tuberculosis scheme for Shillong and the province. He visited various proposed sites for a tuberculosis clinic and hospital at Shillong, and addressed a meeting of administrators and doctors held at Government House. While passing through Calcutta the medical commissioner discussed with the medical authorities of the B. N. and E. B. Railways how best they could co-operate in the anti-tuberculosis campaign.

THE XVII ALL-INDIA MEDICAL CONFERENCE, VIZAGAPATAM, 1940

IN connection with the scientific section of the forthcoming XVII All-India Medical Conference at Vizagapatam during the last week of December 1940, it is proposed to have symposiums in the following subjects in addition to the reading of papers:—

1. Surgery:—Surgical complications of filariasis.
2. Medicine:—High blood pressure, its ætiology, pathogenesis and treatment.
3. Obstetrics:—Maternal injuries of child birth.
4. Venereal Diseases:—Modern treatment of gonorrhœa.

The names of the openers of discussion on the above subjects will be announced in due course.

LOCATION OF TUBERCULOSIS CLINICS

THAT if a tuberculosis clinic is to be of maximum benefit, it should be situated in, or as close as possible to, a thickly populated area, is the unanimous opinion of the committee of experts recently appointed by the Tuberculosis Association of India at the instance of the Government of India to consider what condition should govern the selection of sites for such clinics and whether any particular precautions were necessary in the case of clinics situated in populated areas.

The committee were also of the view that no particular conditions are necessary regarding the distance of a well-conducted clinic from the nearest house. They recommended, however, that if a clinic is located in a part of a building used for other purposes, the clinic should have a separate entrance.

FOR DISTINGUISHED SERVICE IN WAZIRISTAN

HIS IMPERIAL MAJESTY THE KING, EMPEROR OF INDIA, has been graciously pleased to give orders for the following appointment to the Most Excellent Order of the British Empire, for services rendered during the Operations in Waziristan, North-West Frontier Province:—

To be an Officer of the Military Division of the said Most Excellent Order

Lieut.-Colonel Robert Ancel Logan, I.M.S., Officer Commanding, No. 11 Field Ambulance, Waziristan.

THE SULPHONAMIDE GROUP OF DRUGS IN THE TREATMENT OF PLAGUE

WE have received too late for publication in this issue, a paper from Lieut.-Colonel S. S. Sokhey, I.M.S., Director of the Haffkine Institute, Parel, Bombay, by himself, Dr. Wagle, and other members of the staff of this institution, on their results in the treatment of plague with anti-plague serum, sulphapyridine and sulphathiazole. The death rates in their three series were 28 per cent, 24 per cent, and 15 per cent, against 52 per cent, in the control series. The difference between any of the treated series and the control series is significant statistically.

The paper will appear in our next number.

A SIMPLE METHOD OF OBTAINING ANÆROBIOSIS

WE have received an article by Major C. L. Pasricha, I.M.S., and Mr. S. K. Ghosh, of the School of Tropical Medicine, Calcutta, on this subject, for publication; it will appear in a later number. The main points are:—

A desiccator, or other suitable container which can be rendered air tight, is used; an ordinary tall glass tumbler covered with a petri-dish and made air tight with plasticine gives entirely satisfactory results, when only a small number of tubed cultures is to be incubated. Into the bottom of the desiccator are placed some moistened iron filings. There is a complete anærobiosis in about six hours. It is an advantage to evacuate the jar and then to admit hydrogen, but this is not absolutely necessary.

Current Topics

Hæmaturia from Sulphathiazole Therapy in Pneumonia

By JOHN H. ARNETT

(Abstracted from the *Journal of the American Medical Association*, Vol. CXV, 3rd August, 1940, p. 362)

THE tendency of sulphapyridine to form urinary crystals resulting in hæmaturia and even obstruction is by this time well known. Gross, Cooper and Scott have collected from the literature 36 cases of gross hæmaturia, with seven in which uroliths were specifically mentioned, complete bilateral ureteral block being disclosed at autopsy in one instance. Plummer and McLellan have reported two cases of unilateral calculus formation, one of which was fatal. Arnett, Shoup and Henry have reported a case of bilateral ureteral obstruction with recovery. The fact that similar complications can arise in the course of sulphathiazole therapy is now beginning to be recognized. Gross, Cooper and Scott have demonstrated concretions in the kidneys of rats receiving sulphathiazole,

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and Pepper and Horack reported the death of a 77-year-old pneumonia patient who developed hæmaturia and oliguria while on sulphathiazole therapy. At autopsy the kidneys were found to be large and soft and their collecting tubules were dilated and contained crystalline material. In the case here reported severe hæmaturia and lumbar pain were present but the patient recovered.

It is the currently accepted belief that sulphathiazole, like sulphapyridine, may produce hæmaturia mechanically through the irritation caused by the crystals precipitated in the renal tubules and pelves. No doubt the fact that in one present case, because of vomiting, it was impossible to maintain a sufficiently high fluid intake to prevent such precipitation was an important factor in causing the hæmaturia. The fact that such a complication may arise should not discourage the medical profession from using sulphathiazole, which is probably less toxic and more efficacious in cases of pneumonia than sulphapyridine. In 200 cases of pneumonia, half of which were treated by the former and half by the latter drug, Flippin, Schwartz and Rose report only one case of gross hæmaturia, and this occurred in the sulphapyridine group, while the mortality in the sulphathiazole group was lower by 3 per cent and vomiting was much less frequent. The point that should be emphasized is the importance of maintaining a sufficiently high fluid intake to prevent massive crystal formation. The fluid intake and urinary output should receive the watchful attention of the physician, and the urine should be examined at least daily for crystals and blood. If the intake can be kept in excess of 3,000 c.c. and the output at 1,500 c.c. or more a day, and if the drug is immediately discontinued and intravenous fluids are administered with the first appearance of lumbar pain or bloody urine, the dangers from renal complications will be reduced to a minimum.

The Toxic Manifestations of Sulphanilamide and its Derivatives

By P. H. LONG,
J. W. HAVILAND,
L. B. EDWARDS,
and
E. A. BLISS

(From the *Journal of the American Medical Association*, Vol. CXV, 3rd August, 1940, p. 364)

It has become increasingly evident as time goes on that physicians often hesitate to use sulphanilamide or its derivatives because of a fear of the toxic manifestations of these drugs, while patients, because of their lack of appreciation of the possible toxic manifestations of this group of drugs, demand that the drugs be administered to them. These attitudes have at times brought about a somewhat peculiar situation.

It has seemed to us that physicians have been 'oversold' on the dangers connected with the use of sulphanilamide and its derivatives and that these drugs can be used with greater impunity than has hitherto been considered possible. It is for this reason that we have carefully analysed the incidence and types of toxic reactions occurring in hospitalized adults, 1,000 of whom were treated with sulphanilamide, 297 with sulphapyridine and 291 with sulphathiazole in the Johns Hopkins Hospital during the past few years. The results of this analysis are shown in the accompanying table.

It is obvious that certain deductions can be made from this group of patients in respect to the frequency and severity of the toxic manifestations of sulphanilamide or its derivatives, and we think that by a careful study of the clinical histories of these patients certain general conclusions can be drawn regarding the care of patients who are receiving these drugs.

In the first place it is to be noted that nausea and vomiting constitute a problem only as far as sulphapyridine therapy is concerned. We have noted that the more highly integrated the patient is, the greater the chance that nausea and vomiting will occur in the course of therapy with sulphapyridine. In our Negro patients and in children, nausea and vomiting have caused little if any difficulty in the maintenance of therapy, but in the private wards this toxic manifestation has occasionally been a problem of grave importance. When severe nausea and vomiting occur, the fluid intake should be kept at a high level and sodium chloride administered either by mouth or parenterally in order to prevent dehydration and hypochloræmia from developing.

Although adequate statistics are not available, it has seemed to us that dizziness is more common in the course of sulphanilamide therapy than when sulphapyridine or sulphathiazole is being used. The recognition that dizziness may occur is of great importance, especially with respect to patients who drive automobiles, perform heavy or light mechanical work, pilot airplanes or conduct other types of vehicles. All ambulatory patients who are receiving these drugs should be warned of the consequences that may arise from attacks of dizziness.

True toxic psychoses due to the drug are fortunately rare, but they may take almost any form; if a maniacal type of psychosis is present the patient should be carefully watched lest harm come to him. In general it is always best to stop the drug when such toxic manifestations arise. Neuritis, either peripheral or central, is fortunately very rare in the course of therapy with sulphanilamide, sulphapyridine or sulphathiazole, but if evidence of this toxic manifestation is noted the drug should be immediately stopped.

Cyanosis, either mild or severe, is very common in the course of treatment with sulphanilamide but is of little importance except possibly in older persons suffering from emphysema or any type of cardiac disease. In the course of treating lobar pneumonia with sulphapyridine we have never noticed that this drug contributed significantly to the cyanosis already present, and indeed we have repeatedly observed that successful chemotherapy was attended by a marked decrease in the degree of cyanosis present. Our experience with sulphathiazole leads us to believe that this drug produces minimal degrees of cyanosis.

Acidosis has not been reported in the course of sulphapyridine or sulphathiazole therapy, and in our experience it has practically been eliminated as a toxic reaction of sulphanilamide therapy by the concurrent use of sodium bicarbonate with each administration of sulphanilamide. We have never seen a clinical example of alkalosis produced by the administration of sodium bicarbonate in the course of sulphanilamide therapy.

Drug fever is an extremely common toxic manifestation in the course of sulphanilamide or sulphathiazole therapy. It may occur at any time from the first to the thirtieth day of treatment, but it is most commonly seen between the fifth and ninth day of treatment. Drug fever may be of three clinical types: a hectic remitting fever accompanied by chills of great severity, a steadily mounting fever and a low continuous fever. We are frequently asked to distinguish between the fever produced by the drug and the fever produced by infection. Since drug fever occurs most commonly from the fifth to the ninth day and since one expects the temperature of adequately treated patients to be normal by the third day, the appearance of fever, when all clinical signs are pointing toward a favourable termination of the disease, should immediately lead one to suspect that the rise in temperature is due to the drug and not to a recrudescence of the infection. Another factor of considerable importance is that when drug fever appears the patient begins to feel bad and almost always complains of headache and generalized malaise.

Simple drug fever in itself is probably not a dangerous toxic manifestation, but it has always seemed best to us to discontinue the drug if it makes its appearance. When the drug is stopped and fluids are vigorously forced, the temperature should return to normal within twelve to seventy-two hours, depending on the rapidity with which the drug is eliminated from the body. The slower the elimination of the drug, the more prolonged will be the fever.

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Drug rashes are common in the course of sulphanilamide and sulphathiazole therapy but do not occur very often when sulphapyridine is being used. They may take any form, and we have seen erysipeloid, scarlatiniform, morbilliform, purpuric, erythema multiforme, papular, vesicular, pustular and nodular eruptions. In severe instances (especially if the drug is continued) the rash may progress to an exfoliating dermatitis. Rashes may occur at any time from the first to the thirtieth day of therapy. In a certain number of instances photo-sensitization of the skin seems to play a rôle in the production of the rash. For this reason patients who are receiving treatment with sulphanilamide or one of its derivatives should stay out of the sun until at least three days after cessation of therapy. A curious idea has recently become prevalent in this country, namely, that patients who have received sulphanilamide or one of its derivatives during the winter should keep out of the sun during the summer. There is absolutely no foundation in fact for this rumour.

Hepatitis characterized by jaundice without anæmia and a definite impairment of liver function has occurred in 0.6 per cent of patients who have been treated with sulphanilamide. This toxic reaction may occur early or late in the course of therapy. It has been noted that occasionally it accompanies dermatitis exfoliativa. In our experience the prognosis has been excellent if the drug is stopped immediately and fluids are forced, and as far as we know there has been no permanent impairment of liver function following recovery from this toxic reaction of sulphanilamide therapy. The occurrence of hepatitis in the course of sulphapyridine therapy has been reported, but we have not seen it in our series of patients treated with this drug. As far as we know, hepatitis has not occurred in the course of sulphathiazole therapy, although it is to be expected.

Leukopænia with granulocytopænia may occur early or late in the course of therapy with sulphanilamide or its derivatives. In adults this toxic manifestation is relatively uncommon. We have noted a sharp drop in the leukocytes following a single dose of sulphanilamide in certain cases, and we have also noted that granulocytopænia may not occur until the sixtieth or seventieth day of treatment. Hence one must always be on the lookout for this type of toxic manifestation. It has been considered best to stop therapy with the drug if this toxic manifestation makes its appearance, but it must also be remembered that as far as we know there have not been any deaths reported from disturbances of the white cells during the first twelve days of therapy with any of these drugs.

Acute agranulocytosis is a rare complication of therapy with sulphanilamide and sulphapyridine and has not yet been reported in the course of therapy with sulphathiazole. This complication has in our experience occurred on the fourteenth or on a subsequent day of treatment with these drugs. The most common time for its appearance is between the seventeenth and the twenty-fifth day, although it may appear as late as the fortieth day of treatment. For this reason it is very important to check the white blood cell count at daily intervals on and after the

TABLE

Manifestations of drug toxicity noted in hospitalized adults; 1,000 *treated with sulphanilamide,* 297 *treated with sulphapyridine and* 271 *treated with sulphathiazole*

Reaction	Sulphanilamide	Sulphapyridine	Sulphathiazole
Nausea, vomiting ..	Fairly common	Frequent	Uncommon.
Dizziness	Common	Common	Uncommon.
Psychoses*	0.6%, occur early	0.3%, occur early	Not reported as yet.
Neuritis†	Very rare	Not reported	Not reported.
Cyanosis	Very common, early and late	Faint, common, early and late	Uncommon.
Acidosis*	1.9%, occurs at any time, rare if soda is used.	Not reported	Not reported.
Fever*	10%, generally 5th to 9th day, may occur 1st to 30th day.	4%, generally 5th to 9th day, may occur 1st to 30th day.	10%, generally 5th to 9th day.
Rash*	1.9%, may take any form, generally 5th to 9th day, may occur 1st to 30th day.	2%, may take any form, 5th to 9th day, may occur 1st to 30th day.	5%, nodular type common, may take any form, 5th to 9th day.
Hepatitis†	0.6%, early or late	Not seen, but reported	Not reported.
Leukopænia with granulocytopænia.†	0.3%, early or late	0.6%, early or late	1.6%, early or late.
Acute agranulocytosis† ..	0.1%, occurs 14th to 40th day, common 17th to 25th day.	0.3%, occurs 14th to 40th day, common 17th to 25th day.	Not reported.
Mild hæmolytic anæmia ..	3%, early and late	Rare	Not reported.
Acute hæmolytic anæmia†	1.8%, occurs 1st to 5th day	0.6%, occurs 1st to 5th day	Not reported.
Hæmaturia*	Not reported	8%, generally early	2.5%, generally early.
Anuria with azotæmia† ..	Not reported	0.3%, generally 1st 10 days	0.7%, generally 1st 10 days.
Hyperleukocytosis* ..	Generally in presence of acute hæmolytic anæmia.	Generally in presence of acute hæmolytic anæmia.	Not reported.
Injection of scleras and conjunctivas.*	Not reported	Not reported	4%, may occur with rash and fever, 5th to 9th day.
Purpura hæmorrhagica† ..	Not seen, but reported	Not seen, but reported	Not reported.
Ocular and auditory disturbances.*	Rare	Rare	Not reported.
Jaundice†	With acute hæmolytic anæmia or hepatitis.	With acute hæmolytic anæmia or hepatitis.	Not reported.
Painful joints* ..	Reported	Not reported	Reported with rash, etc.
Stomatitis*	Rare	Not reported	Not reported.
Gastro-intestinal tract disturbances.*	Bleeding rare, diarrhœa uncommon.	Rare	Not reported.

* Best to stop drug and force fluids. † Imperative to stop drug and force fluids.

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twelfth day of treatment with sulphanilamide or its derivatives. If the white blood cell count drops and the polymorphonuclear leukocytes are decreased, it probably means the beginning of acute agranulocytosis. The drug should be stopped and fluids vigorously forced in order that the drug may be eliminated from the body as quickly as possible. Outside of this measure, it is probably unwise to attempt other therapeutic procedures designed to combat the agranulocytosis, except that we believe that it is a good plan to use transfusions when the hæmoglobin content falls below 70 per cent. In our experience the prognosis of agranulocytosis occurring in the course of therapy with sulphanilamide and its derivatives is good if the toxic reaction is recognized in its inception.

Mild, slowly developing hæmolytic anæmia, in which the hæmoglobin content drops 20 per cent or more during the first ten days of treatment, has occurred in 3 per cent of the adult patients treated with sulphanilamide. This toxic manifestation is rare in the course of sulphapyridine treatment and has not been reported as yet in patients who are receiving sulphathiazole. In contradistinction to acute hæmolytic anæmia, it seems to occur as frequently in white as it does in Negro patients. These mild anæmias should not be considered as alarming toxic manifestations, as they generally disappear when the drug is stopped and may be combated by the administration of 0.6 gm. of ferrous sulphate daily. In patients suffering from chronic osteomyelitis or other diseases in which it may be desirable to prescribe sulphanilamide over long periods of time, occasional transfusions will help to control these mild hæmolytic anæmias.

Acute hæmolytic anæmias occurred in 1.8 per cent of our adult patients who were treated with sulphanilamide and in 0.6 per cent of those who received sulphapyridine. It has not yet been reported in the course of sulphathiazole therapy. In practically all instances it makes its appearance in the first five days of treatment with these drugs and can almost always be recognized clinically by the sudden development of pallor of the mucous membranes of the mouth and conjunctivas. Mild jaundice almost invariably accompanies this toxic manifestation of drug therapy and is especially noticeable in the scleras. In very acute fulminating cases, hæmoglobinæmia and hæmoglobinuria may be present. Urobilin is consistently found in the urine. We have seen patients whose hæmoglobin content has dropped as much as 70 per cent within twenty-four hours when this toxic manifestation has made its appearance.

If possible, it is always best to stop the drug when an acute hæmolytic anæmia is present. However, in certain cases of severe involvement in which the continuance of therapy has been a life-saving procedure, multiple transfusions have been used in order to maintain the red blood cell count until the critical period of the illness has passed and it is possible to stop the drug. In most instances it has been necessary to administer one or more transfusions to combat this toxic manifestation.

Hæmaturia has not been reported in the course of therapy with sulphanilamide but is quite frequent when sulphapyridine or sulphathiazole is being used. Hæmaturia may be either microscopic or gross and may be a precursor of severe renal insufficiency. We have generally considered it best to stop the drug if hæmaturia makes its appearance, but in several instances we have observed patients in whom hæmaturia developed and in whom the continuance of therapy did not result in any grave kidney lesion.

Anuria with concurrent azotæmia has not been reported in the course of sulphanilamide therapy but has been noted in the course of treatment with sulphapyridine or sulphathiazole. The anuria may be due to a true toxic injury of the tubules of the kidney, probably similar to that seen in mercury bichloride poisoning, or it may be due to the deposition of acetylsulphapyridine or acetylsulphathiazole crystals in the kidney tubules, and on occasion to the blocking of the renal pelves and ureters by calculi composed of acetylsulphapyridine or acetylsulphathiazole.

If anuria makes its appearance, fluids should be forced by mouth and by the parenteral route. If vomiting is present, sodium chloride should be given by mouth or in the form of physiologic solution of sodium chloride by the parenteral route, because it is important to prevent hypochloræmia from developing. If the anuria persists for more than twenty-four hours, the ureters should be carefully catheterized, and if obstruction is found an attempt should be made to wash out the ureters and renal pelves gently with warm physiologic solution of sodium chloride in order to remove the renal calculi. If obstruction is not present, fluids should be forced, and in our experience all such patients have eventually recovered from this toxic manifestation of the drug.

Hyperleukocytosis has been seen in this series of cases only when acute hæmolytic anæmia has been present. We have noticed total white blood cell counts ranging as high as 90,000 cells in the presence of acute hæmolytic anæmia. These very high white blood cell counts probably represent an abnormal response of the bone marrow to a hurried call made on it by the rapidly developing anæmia. In this connection one should always remember that many nucleated red blood cells are being thrown into the circulation and that an allowance should be made for this fact in calculating the total white blood cell count.

Purpura hæmorrhagica has not been seen in any of our cases but it has been reported as occurring in the course of therapy with sulphanilamide and sulphapyridine. If this toxic manifestation is noted, the drug should be stopped and fluids forced.

An injection of the scleras and conjunctivas, which may be so severe as to resemble 'pink eye', has been noted quite frequently in the course of sulphathiazole therapy. It generally occurs between the fifth and the ninth day of treatment with this drug, and its appearance is often heralded by burning and smarting of the eyes.

Other ocular and auditory disturbances, such as visual and auditory hallucinations and changes in visual and auditory acuity, have been noted in the course of sulphanilamide therapy, but they are rare.

Painful joints have been reported in the course of sulphanilamide therapy, and we have noted that several patients who have received sulphathiazole have had exquisitely tender, swollen joints. This toxic manifestation may be puzzling when the patient is suffering from gonorrhœa because of its resemblance to acute gonorrhœal arthritis.

Stomatitis has been encountered rarely in the course of sulphanilamide therapy, while unexplained bleeding from the gastro-intestinal tract has been seen by us on one or two occasions in cases in which sulphanilamide or sulphapyridine was being administered. One patient who was receiving sulphapyridine had such severe bleeding as to bring about death. Occasionally cases are encountered in which the administration of sulphanilamide produces severe attacks of diarrhœa.

COMMENT

It is obvious from this description of the toxic manifestations of sulphanilamide and its derivatives that certain deductions can be made. We believe that, whenever possible, it is wise to utilize every available means of laboratory control in following patients who are receiving sulphanilamide or one of its derivatives. White blood cell counts, hæmoglobin and urine examinations should always be done when circumstances permit this type of control. However, we are convinced that, with the exception of acute leukopænia, all the toxic manifestations of sulphanilamide or its derivatives which may occur in the first two weeks of therapy can be recognized by careful clinical observation, and we feel that no physician should hesitate to administer these drugs in therapeutically adequate amounts, provided he can see his patient at least once a day.

At the time the physician visits the patient who is receiving one of these drugs he should inquire as to his symptoms, especially in respect to headache, body aching or malaise, because these symptoms are often

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the precursors of many of the toxic reactions of sulphanilamide or its derivatives. In addition to an inquiry about symptoms, the scleras should be examined for the presence of jaundice, the mucous membranes for pallor and the skin for evidences of rash. The temperature should always be taken in order to detect whether drug fever is present, and if the patient says that he has been having chills and at the time that it is taken the temperature is normal, arrangements should be made to have the temperature taken frequently during the next twenty-four hours in order to determine whether or not fever is present.

No special precautions have to be observed in respect to the urine of patients who are receiving sulphanilamide, but it is highly important that the urine of patients who are receiving sulphapyridine or sulphathiazole be measured daily. This does not mean that the attendants or family of the patient have to record the urine volume in cubic centimetres or ounces, but any standard measure, whether it is only cups, will suffice. As a matter of fact, in the case of infants it would probably be satisfactory to record the number of voidings daily. In this way it is possible to detect an oliguria which may herald an approaching anuria. The daily examination of the urine under these circumstances should consist of a careful examination of a fresh specimen for gross blood, and at the same time instructions should be given to the patient's attendants to stop the drug and administer fluids in large quantities if the urine looks bloody.

Finally, one should always remember that if a patient has once had drug fever, rash, hepatitis, leukopænia, acute hæmolytic anæmia, injection of the scleras and conjunctivas, diarrhœa or purpura hæmorrhagica in the course of therapy with sulphanilamide or its derivatives he is very likely to have a second, earlier and more severe toxic reaction if the drug is administered a second time. Therefore it is highly important to determine whether or not a patient has previously had a toxic reaction in the course of therapy with one or the other of these drugs. If he gives a history of a toxic reaction in the group which we have just enumerated, it is best to give a small test dose of the drug (0.3 gm.) and observe the patient carefully over a period of twelve hours before cautiously beginning the course of therapy. Patients who have had a toxic reaction caused by one of these drugs may have a similar reaction when another member of the sulphonamide group is prescribed.

Photograph of a Sneeze

(From *Public Health Reports*, Vol. LV, 19th July, 1940, p. 1315)

SANITARIANS have long known that certain diseases are spread by the discharges from the mouth and nose, and that droplet infection plays a rôle in the dissemination of pathogenic micro-organisms. They have also known that such micro-organisms may be discharged into the air in greater numbers and to greater distances by the uncovered cough and sneeze than in ordinary breathing. But since such droplets are not visible under ordinary conditions, the risks of infection by this means have not been fully appreciated by the public, and the precautionary warnings of health officers to 'cover your cough and your sneeze' are not generally heeded.

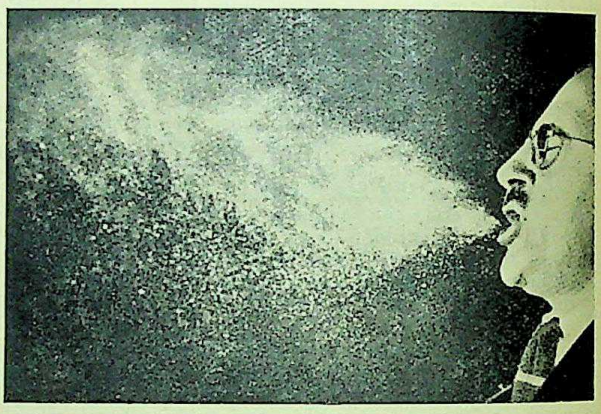
If any one has failed to appraise fully the potential danger of spreading infection to others by an uncovered sneeze, he has only to study the accompanying photograph, taken by Prof. M. W. Jennison, of the Department of Biology and Public Health, Massachusetts Institute of Technology, which shows the expulsion of droplets in a violent, unstifled act of sneezing.

According to Dr. C. E. Turner, who furnished the photograph, the picture was taken by the technique of ultra high-speed photography, which substitutes an instantaneous flash of light for the opening and closing of the camera shutter. This stroboscopic light illuminates the object to be photographed with an intense flash of short duration, the light being placed in such a position in this picture as to illuminate the droplets with a dark-field effect, so that they stand out sharply even in daylight and give photographic images larger than actual droplet size. The time of exposure was about 1/30,000 of a second.

In such a sneeze as that illustrated here, the droplets are numbered in the thousands, varying with the intensity of the expiratory effort. The number of bacteria dispersed in a sneeze may also be very large. It is stated that most of the droplets are under 2 mm. in diameter and that many are less than 0.1 mm.

The 'muzzle velocity' of some droplets is said to be as great as 150 feet a second, and large droplets may be expelled to a distance of 12 feet, although the majority do not travel more than 2 or 3 feet. The involuntary closing of the mouth near the end of a sneeze tends to form a restricted orifice, resulting in the production of more and smaller droplets, which probably come largely from the saliva in the front of the mouth. Also it is apparent from the photograph that the number of droplets issuing from the nose in an unstifled sneeze is insignificant as compared with the number expelled from the mouth. As stated by Jennison and Edgerton, these observations are probably important in relation to infectivity, because of the differences in the microbic flora of the two regions.

Some droplets fall to the floor or ground, while others evaporate, leaving their bacteria suspended in the air,



The expulsion of droplets in an unstifled sneeze.

through which they may be disseminated by air currents.

The bacteriologic and epidemiologic aspects of infection of the air were discussed in a recent article by Wells, Wells, and Mudd, who conducted experiments on the concentration of micro-organisms in the air. They state that 'the numbers of streptococci characteristic of the nasopharynx indicate a hazard of respiratory infection and have a sanitary significance comparable with the presence of *Escherichia coli* in drinking water'. They estimate that several thousand nasopharyngeal streptococci per sneeze are contributed to the atmosphere and that 'the sneeze thus almost seems to be a provision of nature for the survival of nasopharyngeal parasites. Even where the manifestations of a disease do not provide for the wide autodissemination of the infection through the air it has been observed that an outbreak of colds will be followed by the rapid spread of contagion. Sneezing induced by pollens might conceivably facilitate the spread of nasopharyngeal infection . . .'.

Although much is yet to be learned experimentally regarding the physical and other characteristics of expiratory droplets which are factors in determining more accurately the rôle of droplet transmission in those communicable diseases that are spread by nose and mouth discharges, there can be no question that covering the mouth in coughing and sneezing is an important preventive measure with respect to such diseases.

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Fluid for the Surgical Patient

(From the *Lancet*, Vol. II, 17th August, 1940, p. 199)

THE fluid loss of the body in health varies widely with occupation and environment among other things, but Starling puts the normal loss for the average adult at 4½ pints a day, of which about 2½ pints is lost in the urine, 1/5 pint in the fæces, and the remainder by insensible perspiration from the skin or as water vapour from the lungs. The surgical patient often has a big fluid deficit to make up, and during and after operation perspiration is much increased; 6 to 6½ pints a day is therefore a reasonable allowance for the immediate post-operative period. In addition to water the patient needs salt and glucose, but Avery Jones and Naunton Morgan point out that salt may easily be overdone. They suggest 5 g. daily as a sufficient allowance of salt, and if the 6 to 6½ pints of fluid are given in the form of normal saline the patient will get over 30 g. of salt, which he may have difficulty in excreting. The retention of salt may then lead to the accumulation of water in the tissues which may produce subcutaneous œdema or water-logging of the lungs and delay the healing of wounds. Normal saline is therefore unsuitable for prolonged administration, but it is useful in replacing electrolytes lost by vomiting or sweating. For rectal infusion Jones and Morgan recommend normal saline diluted with four parts of tap water (0.18 per cent NaCl), though tap water alone is often sufficient and is well tolerated. For continuous intravenous infusion the solution is made up of one part of normal saline and four parts of 5 per cent glucose in distilled water. This solution contains 0.18 per cent NaCl and 4 per cent glucose, and is isotonic. Hypertonic saline has a strictly limited application in surgery apart from its use as a diuretic and for reducing intracranial pressure, but it is of value in cases of paralytic ileus where there is stagnation of fluid in the dilated intestinal loops. More complicated solutions such as Ringer's and Hartman's have had a certain vogue, but they are unnecessary in most surgical cases.

If the patient can and will drink and there is no other contra-indication the fluid should be given by the mouth. This obvious principle is sometimes forgotten. In comatose or unco-operative patients the fluid can be given by a tube passed into the stomach through the nose or mouth. After the mouth the rectum is probably the next best route, and up to 10 pints can usually be given daily in this way by a continuous drip delivering not more than 30 to 40 drops a minute, using a small rubber catheter (no. 9) but occasionally a feeble ill patient cannot tolerate the catheter or retain the fluid in his rectum. Nowadays it is the fashion to pour fluid straight into a vein, but this has some serious disadvantages. It is fatally easy to give too much fluid or to give it too quickly, for by this route the blood stream has no choice but to take what is given it. Moreover, as Walther has remarked, the saline is mixed directly with the blood and thus reduces still further the concentration of plasma proteins which will already be low after an operation, whereas fluid given by the mouth or rectum passes through the liver first, and will be able to pick up protein *en route* before entering the pulmonary circulation. Inserting a needle or cannula into a vein may be difficult for the inexperienced, especially in a collapsed patient, the subsequent infusion needs careful watching, and the needle often needs readjustment or even reinsertion. Hypodermoclysis is easy but not much fluid can be given by this route; there is also great danger of infection, and glucose solutions may cause aseptic necrosis. Intraperitoneal infusion is seldom used except in babies, for it is risky and has few advantages.

Lately, Billimoria and Dunlop have described a simple method of administering fluids intramuscularly. The only special instrument required is a long strong needle fitted with a sliding shield. Little skill or time is needed for inserting the needle and setting up the apparatus. If two needles are used—one in each thigh—more than 8 pints of fluid can be given in a day and infusion by this route has been maintained continuously for eight days. If the fluid is given too rapidly it is held up as local œdema, thus safeguarding the pulmonary and systemic circulations against dangerous flooding or dilution. Infection is rarely encountered if strict aseptic precautions are observed. Glucose in 5 per cent solutions may safely be given in this way, but care must be taken that none of the solution collects in the subcutaneous tissues. This method is not new and its soundness is well established; it deserves to be more widely adopted.

Reviews

RECENT ADVANCES IN ENDOCRINOLOGY.—By A. T. Cameron, M.A., D.Sc. (Edin.), F.I.C., F.R.S.C. Fourth Edition. 1940. J. and A. Churchill, Limited, London. Pp. viii plus 432, with 67 figures, including three plates. Price, 18s.

ENDOCRINOLOGY is one of the most virile of the medical sciences, and after a period of four years there are enough 'recent advances' to fill a whole volume. The author has however interpreted the term in the more liberal manner and has interwoven his account of the advances of these four years with that of the advances of the last decade or so. Most of the important sections have been completely rewritten and certain obsolete matter deleted, but the net result is an increase of about 20 per cent in the printed matter. There has been a 25-per-cent increase in the matter on each page without loss to readability; this has allowed an actual reduction in the number of pages.

One of the most important advances in the last four years has been the synthesis of a number of hormones. The physician is liable to accept these chemical triumphs too lightly, but he cannot ignore their practical importance. One example is desoxycorticosterone acetate; though it has not entirely displaced gland-extracted cortin, which also probably acts by virtue of its impurities, it can at least be used as a substitute for this expensive gland product in a number of occasions, and it may mean that the man of moderate means with Addison's disease will be kept alive as a useful member of society for a considerable time. A reference in this volume is made to a patient who was maintained in almost normal health for at least two years with 25 c.cm. of cortin daily, but, to compensate for the labour involved in preparing this amount of gland extract, the individual would have to be a very valuable member of society. Another advantage of the synthetic preparation is that tablets can be inserted subcutaneously for maintenance dosage.

Equally important advances have been made in the realm of sex hormones and here again synthetic preparations are well established.

The impression that one gains from reading this important review on the present status of endocrinology is that, if the science is not prostituted by adventurer manufacturers and advertisers and the too-easily-victimized polytherapy-practising members of the profession, it has a very bright future.

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DERMATOLOGIC ALLERGY: AN INTRODUCTION IN THE FORM OF A SERIES OF LECTURES.—By M. B. Sulzberger, M.D. 1940. Charles C. Thomas, Springfield, Illinois. Pp. xxii plus 540, with 13 coloured plates and 39 illustrations. Price, 47s. Obtainable from Messrs. Baillière, Tindall and Cox, London

THIS book is arranged as a series of fourteen lectures. The first is devoted to definitions and classification of skin allergy, and the second is on the protective nature of the skin and its importance as a possible originator of allergic changes. Lecture three is on the basic phenomena in allergy and lecture four describes how to investigate a suspected case of skin allergy.

These four lectures make an excellent introduction to the study of this difficult subject, and having acquired that knowledge the student is next taken through the principal types of allergic skin reaction in the next nine lectures, and lecture fourteen is an interesting and speculative consideration of the future of allergy in medicine.

At the end of the book there are several appendices one of which is particularly useful as it gives a long alphabetically-arranged list of substances used in patch tests with the strengths of the solutions and the solvents it is best to use for each of them, and another appendix of practical value is one of 30 pages in which the general management of urticarial and eczematous conditions is discussed, apart from their allergic aspect.

The author modestly describes his book in the opening sentence of the preface by saying it is not a book of reference nor an encyclopædic treatise on allergy. On this account it is all the more useful to the average practitioner who is concerned primarily with treating and curing his cases, because he can obtain from its pages more than he will usually need in the treatment of allergic skin diseases, without having to flounder through a welter of irrelevant and often contradictory statements such as a complete reference book on allergy must contain.

It is a book we can heartily recommend to all those who want a working knowledge of allergic dermatitis and how to treat it, and at the same time they will acquire a sufficient insight into the scientific aspect of the subject to show what a fascinating field it offers to those with inquiring minds.

P. A. M.

ROSE AND CARLESS MANUAL OF SURGERY: FOR STUDENTS AND PRACTITIONERS.—By C. P. G. Wakeley, D.Sc., F.R.C.S., F.R.S.E., F.R.S.A., F.A.C.S., F.R.A.C.S., and J. B. Hunter, M.C., M.Chir. (Cantab.), F.R.C.S. (Eng.). Sixteenth Edition. Volumes I and II. 1940. Baillière, Tindall and Cox, London. Pp. xi plus 840 in volume I and pp. from 841 to 1708 and 48 index pages in volume II. Price, 30s. for two volumes

'ROSE AND CARLESS' is too well known to students and teachers to require a lengthy introduction. Except for one gap due to the last war, revisions of this textbook have been made at three-yearly intervals, and it is now in its sixteenth edition. But comparison of this with the two previous editions reveals that very important improvements have been made.

In the first volume, the first eight chapters show considerable alteration and now provide a concise introduction to surgical pathology which it would be hard to equal. For the rest, new descriptions of neurosurgery and much-needed revision in the section on fractures deserve special mention.

There are many new illustrations, and some of the old ones have been redrawn; they are perhaps of greatest value in the chapters on abdominal surgery, and include a coloured plate depicting gastroscopic appearances.

In the chapter on hernia the following passage is to be found: 'The most satisfactory operation of all for inguinal hernia, and that associated with the least number of recurrences, is some modification of Gallie's operation.' This is at variance with the opinion of many teachers, and also with a remark made by the senior editor in his Hunterian lecture on 31st January, 1940, which reads, 'During the last few years fascial grafts for the repair of an inguinal hernia have come into vogue, and it has been claimed that the results are better than by other methods. I cannot agree that this view . . . ' (*vide The Lancet*, 4th May, 1940, p. 822).

As before, the second volume contains chapters on special subjects by various contributors, and the section on tropical surgery has again been written by Sir Frank Connor.

Two new chapters attract special attention. The first is an excellent one on anæsthetics by Dr. Vernon Hall. If anæsthetists in this country would put into practice some of his teachings, the lot of both surgeon and patient would be immeasurably improved. The other chapter, the last in the book, is devoted to war surgery. In it the editors have laid down the general principles of this branch for the guidance of medical officers on active service.

Although larger and more profusely illustrated than before, the price of this book remains the same, so that one has no hesitation in predicting its continued popularity.

W. McN. N.

SHOCK: BLOOD STUDIES AS A GUIDE TO THERAPY.—By John Scudder, M.D., Med., Sc.D., F.A.C.S. 1940. J. B. Lippincott Company, Philadelphia and London. Pp. xvii plus 315, with 55 illustrations, 5 plates—3 of which are in colour. Price, 30s.

THIS book is a record of experimental work on shock. It is also incidentally an historical bibliography of earlier work, and it will always justify its shelf-room on account of its bibliography of 533 references, and its historical record of the developments in our conception and treatment of shock, and in our knowledge of the functions of the adrenal gland and of the physiological effects of potassium. The author's own work could however have been reported more concisely and therefore more usefully in a reasonably-sized article in some journal devoted to experimental medicine.

One of the main contentions of the writer is that careful blood examination in each case is essential as a preliminary to proper treatment. One of the effects of shock is hæmoconcentration, which can be shown by an increase in specific gravity, but this may be associated with an actual loss in the proportion of red cells to the circulating blood, which will be indicated by a cell volume estimation. He might go further and suggest that a total red cell count should always be done, for after hæmorrhage there is an increase in size of the individual red cell, so that an increase in cell volume might cover a loss in numbers of red cells and an actual decrease in cell-plasma interface.

Another point made is the increase in plasma potassium in shock and also in stored blood, so that obviously the latter is unsuitable for use in shocked patients, and plasma separated at an early date would be much better.

The volume is a beautiful example of the best American book production and the writer's style is lucid, though he lapses now and then into the jargon of the careless medical writer, *e.g.*, 'at the time of her operative death'. What *would* A. P. H. say?

DISEASES AFFECTING THE VULVA.—By Elizabeth Hunt, B.A., M.D., Ch.B. (Liverpool). 1940. Henry Kimpton, London. Pp. xiii plus 215, with 36 illustrations and 18 plates in colour. Price, 21s.

A BOOK such as Dr. Hunt's 'Diseases Affecting The Vulva' is very welcome indeed, and Dr. Hunt may rest assured that it will 'prove of assistance in the treatment of the many women who suffer so seriously and so long', the hope she expresses in her preface.

After an introduction, in which allergy is very clearly explained, the anatomy and development of the vulva are described. There is an excellent chapter on the histology of the vulval tissues and then the author goes on to the description of all those diseases which

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affect the vulva. Each condition is taken completely under the headings 'Ætiology', 'Clinical Manifestations', 'Diagnosis' and 'Treatment' and where necessary 'Complications', 'Histopathology' and so on are added. The descriptions are clear and concise, and really portray pictures. The author, though not dogmatic, is definite in her opinions on controversial subjects. Treatment is expounded particularly well and includes useful prescriptions for nearly all conditions. Considering the reputation skin diseases have for chronicity a little more space might be devoted to prognosis which is rarely mentioned, except by implication. For example, in discussing the treatment of kraurosis, the author advises the use of vegetable rather than mineral oils 'as these patients may require to use the preparations daily for a prolonged period'. Whether or not a cure is to be hoped for is not mentioned.

The pictures, so clearly described in the text, are supplemented by 28 really beautiful coloured plates and there are, in addition, 36 figures mostly of microscopic sections.

This book, so far as I know the only one of its kind, should be read and kept for reference by all who attempt the treatment of women. This is especially true in India where dermatologists are few and far between and where, unfortunately, skin conditions are often very inadequately treated. Pruritus, the subjective symptom, is more often than not labelled pruritis, a disease, and treated with douches, tampons, and alkaline hip-bath. This may not only fail to relieve the itching but may, as Dr. Hunt emphasizes, do actual harm.

G. B. W. F.

MEDICAL DISEASES OF WAR.—By Sir Arthur Hurst, M.A., D.M. (Oxon.), F.R.C.P., Lieut.-Colonel, late R.A.M.C. With the Co-operation of H. W. Barber, M.A., M.B. (Cantab.), F.R.C.P., F. A. Knott, M.D. (Lond.), M.R.C.P., and T. A. Ross, M.D. (Edin.), F.R.C.P. 1940. Edward Arnold and Company, London. Pp. viii plus 327. Illustrated. Price, 16s.

THIS book deals with the medical diseases that are the results of or are encountered during wars, and it is based on the author's varied experience of these diseases during the last great war and the post-war period.

More than half of the book deals with the various aspects of war neurosis. These chapters, which contain numerous illustrative case notes, are the results of original studies that Sir Arthur Hurst carried out among the soldiers of the last great war, and they form a brilliant exposition of the subject. Besides war neurosis, some acute infectious diseases, skin diseases, war nephritis, gas poisoning—the other diseases that are likely to be encountered in an European war—have been adequately discussed. Some of the diseases that are likely to occur in a tropical campaign have not been described in this book. This is unfortunate, for the present war is no longer limited to Europe, but has spread to tropical countries.

The book is written by one of the most eminent men in the medical profession in England and the various chapters written by him bear the stamp of a master of the subject. The author has invited collaboration of well-known specialists in writing some of the special sections. This has further enhanced the usefulness of this single volume dealing with the various diseases of war.

The book will undoubtedly be of help to medical officers called upon to treat soldiers and civilians during the present war.

P. C. S. G.

A MANUAL OF EMBRYOLOGY: THE DEVELOPMENT OF THE HUMAN BODY.—By J. Ernest Frazer, D.Sc. (Lond.), F.R.C.S. (Eng.). Second Edition. 1940. Baillière, Tindall and Cox, London. Pp. x plus 523, with 282 illustrations. Price, 30s.

NINE years ago when Professor Frazer produced the first edition of *Manual of Embryology* he departed from the traditional method of taking each and every organ separately and describing its development. He introduced the new method of giving as far as possible regional descriptions. This has not only made the book enjoyable to read, but it gives a clear picture of the growth of the body as a whole and not as he says 'a patchy series of discrete descriptions of the formation of organs'.

Another departure was the omission of references and the failure to point it out always when the author's descriptions deviated from those then generally accepted. Since then Professor Frazer's views on development have become universally known and the student will never be far wrong if he accepts them *in toto*.

The drastic cutting down of detail, the author states in his preface, is not pleasant. This is indeed true, more detail would be welcome in every section.

One disadvantage of the regional method—which is really an asset—is that the student swatting for his anatomy examination is unable to turn up the textbook and learn off an embryological note for each organ. This was a very popular method of 'learning embryology'. Actually it is not too much to hope that any student trying to use Frazer's *Embryology* in this manner will become interested in the subject and really learn something; certainly the text is sufficiently interesting to hold the attention of the serious student if once he dips in. Some space devoted to the various abnormalities of development would add to this interest and would be appreciated in the next edition.

The 1940 edition is on the same plan as the first edition though there are minor changes in its arrangement and some additions including seven new diagrams and new accounts of the umbilical cord, fœtal circulation, and the sinus venosus.

Few misprints have been carried over into the new edition, for example, on page 169 in the penultimate sentence 'hind-brain' has been written instead of 'mid-brain', and, in figure 7, U.C. has been used to identify two different things, the umbilical cord and the uterine cavity.

The paper and printing in the new edition are distinctly superior.

G. B. W. F.

FORENSIC CHEMISTRY.—By Henry T. F. Rhodes, Dip. Inst.C. (Lyon). 1940. Chapman and Hall, Limited, London. Pp. viii plus 214. Price, 12s. 6d.

THIS little book by a worker in France covers remarkably well the ground common to the police and the chemist. It is much more than the toxicology which is usually associated with forensic medicine. References are plentiful and will provide, when necessary, details of procedures.

With a view to increasing the utility of the next edition of this useful book the following suggestions are offered: (*i*) removal of certain obscurities (p. 13, third para.; p. 95 last para.; p. 175 first para.) and an unnecessary restriction (p. 176, not keeping sulphuric acid in glass bottles); (*ii*) differentiating between blood *groups* and blood *types;* (*iii*) clarification of description by rearranging headings and sub-headings and indicating them by the usual system of lettering or numbering (a heading in CAPITAL letters should not be a part of a narrative under a heading in small letters, an instance on p. 129, and items whose relationship is one of genus and species should not be headed alike when following one another, an instance on p. 183); and (*iv*) inclusion of sweat analysis undertaken for turf clubs (samples from horses suspected to have been drugged have been sent to France for many years from all over the world).

The paper, the printing and the binding are good. Only one printer's error arrests attention (p. 121 last para. 'd ocuments'). The price perhaps could be lowered in normal times.

The book should be available to all investigators of crime.

S. D. S. G.

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AN INVESTIGATION OF THE TECHNIQUE OF PSYCHO-ANALYSIS.—Edited by Edward Glover, M.D. 1940. Published for the Institute of Psycho-analysis by Baillière, Tindall and Cox, London. Pp. ix plus 188. Price, 10s. 6d.

WITH this book Dr. Edward Glover makes another valuable contribution to the science of psycho-analysis. As director of research to the Institute of Psycho-analysis, he occupied a position which enabled him to make an attempt to correlate and systematize the technique employed by British psycho-analysts. The method he employed to achieve his purpose was the questionnaire method. The first questionnaire was sent out in July 1932 to twenty-nine practising analysts. Replies were obtained from twenty-four. These replies were submitted to the British Psycho-analytical Society for discussion. After this a supplementary questionnaire was sent out dealing with matters about which more information seemed desirable and raising a number of additional issues omitted in the first questionnaire. Further discussion took place on the basis of this fresh information. The results of these discussions were incorporated in a report. This report is divided into sections and sub-sections dealing with a central topic or group of related topics. Each section includes a summary of the relevant answers given in response to both questionnaires and comments on these. The net result of all this makes highly instructive reading for practising analysts as well as for those undergoing training to become analysts.

O. B-H.

A METHOD OF ANATOMY: DESCRIPTIVE AND DEDUCTIVE.—By J. C. Boileau Grant, M.C., M.B., Ch.B., F.R.C.S. (Edin.). Second Edition. 1940. Baillière, Tindall and Cox, London. Pp. xxii plus 794, with 651 illustrations. Price, 33s.

MOST students, especially Indian students, can learn sufficient anatomy from one of the standard textbooks to get them through their examinations. But much of what they learn is imperfectly understood, so that not a great deal of anatomical knowledge is retained to help them through their final studies and their careers.

The author, who is Professor of Anatomy in the University of Toronto, teaches his students to learn anatomy by 'Correlating facts, that is, studying them in their mutual relationships. This leads inevitably to the apprehending of the underlying principles, and the *raison d'être* of such relationship'. This method of learning anatomy is presented in his book, now in its second edition.

The text is divided into sections corresponding with the different regions of the body, but an improvement in the form of an introductory section appears in this edition. This affords the beginner a conspectus of the whole subject of anatomy in the short space of seventy pages. Having thus acquired a foundation of elementary anatomy, it will not be difficult for him to appreciate and remember the more detailed information set out in the succeeding chapters.

The arrangement of the regional sections is unorthodox because the usual sequence of osteology, syndesmology and so on, is not always followed, especially if there are more important features which, by being taken first, simplify the description. In the same way, embryology and comparative morphology are not to be found in a separate section, but scattered throughout the text wherever they may be required to clarify a point of anatomy or relationship. This arrangement makes the assimilation of facts comparatively easy, but the reader will soon find that this is not a complete textbook. Certain omissions from the regional sections are made good in a miscellaneous section at the end of the book, but, to give an example, there is no description of the brain and spinal cord.

The book is published in royal octavo, but there are two columns to a page, and the text is broken up by numerous excellent bold line drawings.

W. McN. N.

MEDICAL RESEARCH COUNCIL. SPECIAL REPORT SERIES NO. 239. 'A COMPARATIVE STUDY OF THE SEASONAL INCIDENCE OF MORTALITY IN ENGLAND AND WALES AND IN THE UNITED STATES OF AMERICA.'—By E. Lewis-Faning. 1940. Published by His Majesty's Stationery Office, London. Pp. 69. Illustrated. Price, 1s.

'SEASONAL variation of mortality has for long been a fact of common remark and a subject of speculation. When official medical statistics made it possible to measure the phenomenon, attention was mainly devoted to such questions as the influence on the death rate of abnormal cold in winter or abnormal heat in summer. Only of recent years and in a few countries have detailed data become available which relate to many diseases, cover wide areas and extend over adequate periods of time.'

'The present report contains a statistical analysis of data available with respect to England and Wales and to the United States of America. Consideration is also given to the figures for Germany, but this has necessarily been limited in scope owing to the fact that few of the data are published in comparable form. The broad result is that in England and Wales mortality in the winter is relatively higher and in the summer relatively lower than in the United States; but, on balance, what is lost in the winter is greater than what is gained in the summer. Indeed, when England and Wales are compared with New England alone, the summer advantage of England and Wales is reduced to about 4 per cent.'

'The largest contributors to the unfavourable winter balance are respiratory tuberculosis, influenza, pneumonia and bronchitis; the total excess mortality from these, in England and Wales, comes to more than 10 per cent of the whole standardized death rate in February. In July the seasonal advantage of England and Wales depends on lower death rates attributed to diseases of the heart and to deaths from violence.'

'The net debit balance cannot well be due to climatic factors, considering the advantage which the insular climate of Great Britain has in its comparative freedom from the great extremes of temperature commonly experienced in continental areas such as those of Europe and North America. The explanation may more reasonably be sought in hygienic conditions. In this respect, it is to be noted that the causes of mortality which determine the unfavourable relative position in the winter are, with the possible exception of influenza, those diseases which by common consent are amenable to environmental influences and—conspicuously pneumonia and bronchitis—have long displayed great regional contrasts in mortality rates within the country.'

'It may be concluded that the present study contributes, from another angle, a further argument in support of the general conclusion that there is much preventable mortality in England and Wales which is not in fact prevented.'

MEDICAL RESEARCH COUNCIL. SPECIAL REPORT SERIES, NO. 240. 'PATHOGENIC ANÆROBIC ORGANISMS OF THE ACTINOMYCES GROUP.'—By Dagny Erikson. 1940. Published by His Majesty's Stationery Office, London. Pp. 63. Illustrated. Price, 1s.

'A DETAILED study has been made of twenty microærophilic Actinomyces strains derived from pathological processes, fifteen being of human and five of bovine origin. The fifteen human strains have reacted as one group within which only minor variations could be demonstrated, whilst the bovine strains have proved almost identical with each other, but different from the human strains. It has been shown that the outstanding differences between the two are as follows: morphologically, a greater degree of polymorphism on the part of the human strains and, in particular, a firm, generally adherent growth on solid media, whereas the bovine strains form more uniform, soft, smooth colonies; physiologically, a greater ability to ferment sugars on the part of the human strains; serologically, a lack of reaction between the two types. A survey of

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the relevant literature has been made, from which it has appeared that the human type coincides with the original description of Wolff and Israel and with the majority of reported strains of human origin, while accounts of a soft-growing form have occurred preponderantly in the veterinary literature.

The fifteen human strains here studied are all representative of *A. israeli*, and the five bovine strains should be regarded as a distinct species—*A. bovis*. A complete lack of serological relationship has been demonstrated between, on the one hand, the anærobic *A. israeli* and *A. bovis* and, on the other, representative ærobic species, both non-acid-fast and acid-fast, belonging to Orskov's groups I and II respectively.'

TRENDS IN ORGANIZED MEDICINE IN INDIA.—By A. Viswanathan. Published by the 'Indian Medical Journal', 131, Coral Merchant Street, Madras. Pp. 62. Price, Annas 8

ANY attempt to improve the status of the medical practice in India is always welcome. The emphasis is too liable to be on the individual and much time is spent on arguing about the relative merits of the licentiate and the graduate. It will not solve the problem of medical relief in India either to lower the status of the All-India Medical Register by including all licentiates, however defective their education (they themselves are the first to appreciate the defects and all realize that these are no faults of their making), or even of raising the standard of the education of licentiates to the graduate level (which could only be done by abolishing many of the grossly defective medical schools), for some means must be worked out to get the medical men we have to the people who need them.

Dr. Viswanathan has not altogether lost sight of this fact in his stimulating examination of the problem of medical organization in India, though perhaps he has not emphasized it enough to please the reviewer. However, the author has expressed a point of view that has much to be said in its favour.

J. F. SUTHERLAND'S FIRST AID TO INJURED AND SICK.—Revised and Rewritten by Halliday Sutherland, M.D. Forty-second Edition. 1940. E. and S. Livingstone, Edinburgh. Pp. 77, with 46 diagrams, 1 coloured. Price, 6d.; postage, 2d.

A BOOK of the moment. This is a remarkably complete little book that we can thoroughly recommend to all 'first-aid' students and their teachers. It is difficult to believe that so much valuable information could be crowded into so small a space. There are some 45 figures and the book could be slipped into the waist-coat pocket of a well-dressed man without offending his tailor. And the price is only six pence.

BAILLIERE'S NURSES' COMPLETE MEDICAL DICTIONARY.—Revised by Margaret E. Hitch, S.R.N., and C. F. Marshall, M.D., M.Sc., F.R.C.S. Eighth Edition. 1940. Baillière, Tindall and Cox, London. Pp. xii plus 473. Illustrated. Price, 3s. 2d.

THIS is a very useful dictionary, and though it is designed for nurses, we can recommend it to medical students, on the one hand, and St. John's Ambulance workers, on the other.

One reads that '*tubercular*' means 'pertaining to or resembling tubercles' and that *tuberculous* means 'infected with or pertaining to tuberculosis'. One wishes also that this useful book would teach nurses that 'this is a new *admit*' is not English, and that 'patients' not 'cases' vomit or die, but perhaps this is asking too much.

We again recommend this new edition as an excellent little book.

Abstracts from Reports

REPORT ON THE PUBLIC HEALTH ADMINISTRATION OF THE CITY OF RANGOON FOR THE YEAR 1939

FROM the point of view of public health, the year compared favourably with the previous year. The total number of deaths registered during the year was 11,327 compared with 12,214 in the previous year thus showing a decrease of 887 deaths—notifiable diseases being responsible for a decline of 410 and other principal diseases for 477 deaths. The death rate calculated on the census population of 1931 was 28.29 per mille as compared with 30.50 in the previous year. In the Burmese, Chinese, European and Anglo-Indian communities, the death rate was practically the same as in the previous year but the Hindus and Mohammedans showed a lower death rate.

The number of deaths from cholera during the year was 11 compared with 7 during the year 1938, the average number of deaths from this disease for the last 10 years being 21.

Sixty-eight deaths were accounted for by smallpox during the year against 79 during the previous year and an average of 91 deaths for the last 10 years.

There were 6 deaths from plague compared with 13 deaths in the previous year and a decennial average of 27.

Only 2 deaths from measles were recorded.

There were 17 deaths from diphtheria against 15 deaths in the year 1938.

The number of deaths from cerebro-spinal fever was 16 during the year compared with 39 during 1938, the average number of deaths for the last 10 years being 9.

The number of deaths from beri-beri showed a decline from 266 in the year 1938 to 116 during the year under report, the average number of deaths for the last 10 years being 105.

Eighty-five deaths from enteric fever were recorded during the year against 70 during the year 1938 and the average for the last 10 years was 61 deaths.

The number of deaths from pulmonary tuberculosis showed a reduction of 242, there being 632 deaths during the year against 874 deaths during the previous year. The average number of deaths for the last 10 years was 847.

Puerperal septicæmia accounted for 21 deaths compared with 18 in the previous year.

The number of deaths from diarrhœa and dysentery was 728 during the year as against 720 during the previous year.

Influenza caused 5 deaths during the year against 4 during the previous year.

Along with the fall in the number of deaths from pulmonary tuberculosis there has been a fall of 149 deaths from diseases of the respiratory system—there being 2,648 deaths during the year as compared with 2,797 deaths during the previous year.

The number of deaths from malaria during the year was 121 compared with 174 deaths in the previous year.

The number of births reported during the year was 11,511 compared with 11,095 in the year 1938, the birth rates calculated on the census population of 1931 for the years 1938 and 1939 being 27.71 and 28.75 respectively.

The infantile mortality rate has also declined along with the general death rate, being 270.52 during the year compared with 291.57 during the previous year. The total number of deaths of infants under one year of age was 3,114 compared with 3,235 during the year

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1938—a decline of 121 deaths. Of the total number of infantile deaths, 1,461 (46.91 per cent) were amongst the Burmese, 839 (26.94 per cent) amongst the Hindus, 333 (10.69 per cent) amongst the Mohammedans and 247 (7.93 per cent) amongst the Chinese. The important causes of infantile mortality were as usual convulsions, bronchitis and pneumonia, premature birth, malnutrition, dysentery and diarrhœa and enteritis.

Four thousand seven hundred and sixty-five infants were under the care of the Maternity and Child Welfare Scheme of this department and out of these, 634 died giving a mortality rate of 133.05 per 1,000 against 177.51 in the year 1938. The table below gives the infantile mortality rate amongst infants under the care of the Maternity and Child Welfare Scheme in the city during the last 4 years.

1936	..	145.96	1938	..	177.51
1937	..	139.90	1939	..	133.05

The tuberculosis dispensary maintained its popularity, the number of new patients and the total attendance during the year being 4,927 and 38,039 respectively compared with 3,955 and 34,206 during the previous year.

The number of patients treated at the various other dispensaries maintained by the Corporation was 183,691 compared with 172,087. The total attendances at these dispensaries during the year was 435,910 against 403,582 during the previous year.

There is not much to report with regard to any improvement made in the milk supply of the city. Two thousand four hundred and eighty samples of milk, of which 2,394 were taken by the milk inspectors, were examined. Eight hundred and nineteen conformed to the standard.

The water supply, as usual, was chlorinated and kept at a high standard of bacteriological purity. During the year, treatment of water by chloramine was tried. The results were encouraging but in view of the difficulties of obtaining regular supplies of chemicals as a result of the war, further progress could not be made although chloramine treatment is still being continued.

The staff employed for combating the mosquito nuisance in the city continued to do useful work. The public has now become conscious of the mosquito problem and if sustained efforts are made, the day is not distant when the mosquito problem will become practically insignificant.

ANNUAL REPORT ON THE WORKING OF THE ASSAM MENTAL HOSPITAL, TEZPUR, FOR THE YEAR 1939

THE superintendent has endeavoured, with considerable success, to introduce the modern 'hospital' outlook into the institution, as opposed to the out-of-date 'Lunatic Asylum' atmosphere. The keeper staff have been taught the ideal that inmates of the institution are sick patients and that the proper attitude towards them is that of a nurse in a children's hospital. According to modern ideas of psychological medicine as much freedom as is compatible with safety is given to the patient and mechanical restraint has been done away with. This has, of course, put considerable strain on the staff, but it seems well justified.

Dr. H. C. Barua, the Superintendent, remarks—

'This institution is a mixture of an asylum, a jail and a mental hospital. The majority of the patients are chronic cases requiring life-long asylum treatment. Those cases, however, in whom there is a prospect of cure react adversely during the recovery process, when they are in association with chronic cases. This is also observed as in the case of criminal mental patients who may, after recovery, have to stay in association with chronic cases sometimes for a considerable period before their discharge. These patients fully realize their position and some relapse. For such cases a separate convalescent home is wanted and it is suggested that the two new blocks proposed as a future extension should be built outside the compound and devoted to this purpose'.

The points raised by the superintendent are important and deserve the consideration of Government.

Paying patients.—There were only six patients among the inmates, at the time of submitting the report, who were stated to be capable of paying modest rate of maintenance. This seems an incredibly small proportion.

Sanitation and hygiene.—The defects here are outstanding and have been reported repeatedly. It is almost unbelievable that an institution of this kind, the only one in Assam, should have to carry on its work with a totally inadequate water-supply and with an antiquated arrangement for sterilizing clothing and bedding.

The municipal water-supply, in spite of the high tax charged, is, and seems likely to remain, totally insufficient and a separate plant for the hospital with a good tube-well is essential. Insufficient water brings the inevitable sequel of dirt and disease, and nowhere is it more important to guard against these than in a community composed mainly of mental patients.

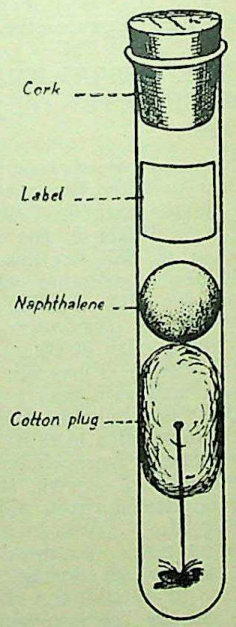
The 'blanket boiler' can only be described as a relic of the past. It should be abolished and replaced by a modern type of steam sterilizer. Efficient sterilizing and perhaps even more important here—effective—delousing is otherwise impossible.

Correspondence

ENTOMOLOGICAL SPECIMENS

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—For a number of years, I have made use of the following plan to demonstrate entomological specimens to students:—



A stout test-tube of suitable width is selected. The specimen to be mounted is picked up on a long entomological needle, and absorbent cotton-wool is wrapped round the shaft of the needle till the cotton forms a closely-fitting bung; the whole is then introduced into the test-tube, the insect being foremost. The cotton plug is carefully pushed in till the specimen is very near the dome-shaped bottom of the test-tube. A naphthalene ball is put in, and the proper label

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giving name, details, etc., is then introduced. A cork or rubber stopper completes the mounting.

Thus preserved, the specimens last for years, and each can be examined in detail with a hand-lens.

I have found that this method saves a lot of time and temper, as heads and legs do not drop off so frequently, and the mounting is able to withstand the onslaught of a series of classes.

Yours, etc.,

P. A. DALAL, L.M. & S. (Bom.),
D.T.M. & H. (Camb.),
(*Late Professor of Bacteriology, Grant Medical College, Bombay*).

242, PRINCESS STREET,
BOMBAY,
24th October, 1940.

Service Notes

APPOINTMENTS AND TRANSFERS

COLONEL R. H. CANDY, C.I.E., K.H.S., is appointed to be Surgeon-General with the Government of Bombay, with effect from the 31st October, 1940.

Lieutenant-Colonel R. S. Aspinall, C.I.E., an Agency Surgeon, is appointed as Residency Surgeon, Mysore, with effect from the afternoon of the 15th October, 1940.

Lieutenant-Colonel M. Das, M.C., made over the executive charge of the Alipore Central Jail to Mr. C. Heath on the afternoon of the 4th October, 1940.

Lieutenant-Colonel F. H. Whyte is appointed to the post of Civil Surgeon, New Delhi, with effect from the forenoon of the 15th October, 1940.

Major E. A. R. Ardeshir made over charge of the office of Superintendent of Rajshahi Central Jail to Dr. Monsural Rahman on the afternoon of 4th October, 1940.

On return from leave Major D. W. B. Read, an officer of the Medical Research Department, is transferred to foreign service under the Indian Research Fund Association, with effect from the 8th July, 1940 (forenoon).

Major G. Milne, an officiating Agency Surgeon, is appointed as Medical Officer in charge of the Crown Representative's Police Force Hospital, Neemuch, with effect from the forenoon of the 16th October, 1940.

The undermentioned officers retire with gratuity and are granted emergency commissions from the dates specified against each:—

Short Service Commission

Captain R. Kasliwal. Dated 23rd September, 1940.

Permanent Commission

Captain A. S. Rao. Dated 10th October, 1940.

To be Captains (on probation)

Tahil Dayaram Chablani. Dated 30th September, 1940, with seniority from 30th September, 1936.

Ram Lall Soota. Dated 10th October, 1940, with seniority, 10th October, 1936.

Motilal Shankhla. Dated 11th October, 1940, with seniority, 11th October, 1936.

To be Lieutenant (on probation)

Thomas Jenner Powell. Dated 3rd August, 1940.

Emergency Commissions

To be Lieutenants

3rd August, 1940

William Hope Stanislaus St. John-Brooks.
John Maurice French.
Malcolm Shaw.
William Raynard Smith.
Gerald Charles Tresidder.
Ronald Houstoun Vasey.

15th August, 1940

Chandra Nath Chatterji.
Kshirode Bihari Roy.
Mohamed Abdul Razak.
Parmeshwar Lal Khurana.
Edaseril Kesava Pillai Kesava Pillai.
Siti Kantha Misra.
Amalchandra Chattopadhyay.
Prasanta Kumar Das.
Gurbachan Singh Lamba.
Pabitra Kumar Paul.
Trikovil Variyathu Ramankutty Wariyar.
Ronald Sushil Chandra Banerji.
Gurtej Singh Dhaliwal.
Cheneerkuppam Thangavelu Subrahmanyan.
Ranjit Kumar Chatterjea.
Ram Sarikhan Prasad Sinha.
Srinivasanallur Matrubhutam Venkatakrishnan.
Sachindra Nath Bose.
Subbarama Pichumani.
Anwar-ul-Islam.
Uma Prosad Das Gupta.
Jacob Jacob.
Biswanath Barat.
Hem Chandra Sen Gupta.
Jyotsnananda Sen.
Pooran Singh.
Aduma Dhirar.
Mohammad Suleman.
Nand Lal Sharma.
Padinjarail Zachariah Abraham.
Bansi Lal Aggarwal.
Vidya Sagar Sharma.
Mir Mohammad Sharif.
Satya Prakash.
Chandar Bhan.
Krishna Chandra Majumdar.
Gaya Kumar.
Harjinder Singh Malik.
Kodaganallur Srinivasa Rama Swami.
Irshad Ali Sahibzada.
Janki Nath Dhar.
Mohammad Alam.
Goraysahib Abdul Aleem.
Birendra Kishore Goswami.
Nirod Ranjan Gupta.
Victor Frederick Siqueira.
Jatish Chandra Sen.

16th August, 1940

Nallakandy Vydier Sridharan.
Sudhindra Nath Bose.
Pulin Behari Bose.
Sudhir Kumar Das.
Suhas Chandra Chatterjee.

17th August, 1940

Indu Bhusan De.

1st September, 1940

Baroda Kanta Bhadury.
Yoginder Singh Bawa.
Dines Chandra Roy.
Kunikuttan Ramakrishnan.
Polichetti Umamaheswara Rao.
Krishna Pillai Balakrishna Menon.
Puttaih Rama Raju.
Kitianda Calappa Ganapathy.
Thottungal Krishnan Rithuparnan.
Doultabad Narayanrao Madhava Rao.
Kannanur Puthan Madhathil Bhavadasan Unni Nayar.
Krishnaswami Siva Rama Krishnan.
Kattoju Paidilingam.
Vadilal Purshotamdas Patel.
Srinivasan Sivarajan.
Gopal Das.
Joti Ranjan Sen.
Shib Chandra Sarkhel.

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Champadil Chandrasekhara Menon.
Kunnariath Gopala Menon.
Ramalinga Iyer Ananthanarayanan.
Ayyub Ahmad Khan.
Nazir Ahmad.
Pudukottah Sivaramakrishna Viswanathan.
Behari Lal Kamra.
Gadahad Vasudeva Rao.
Pagadala Damodram.
Bashir Ahmad.
Kaipuzha Narayanan Nair Sankaran Nair.
Sangram Singh.
Subbier Ganapathi Sundaram.
Mohammad Hanif Ahmed.
Abdul Jabbar.
Har Kishan Lal.
Mohammad Qamaruddin.
Sukhdes Lal Rikhye.
Mahmud Husain Qazi.
Edward Norish Chander Benjamin
Subal Chandra Chatterjee.
Des Raj Batura.
Tejindar Singh Khurana.
Bishan Kishore.
Bishan Chand Bhalla.
Susil Chandra Mazumdar.
Radha Krishnan Arora.

LEAVE

Major-General H. C. Buckley, K.H.P., Surgeon-General with the Government of Bombay, is granted leave on average pay for 1 month and 24 days followed by leave on half-average pay for 2 months and 6 days, with effect from 31st October, 1940.

Lieutenant-Colonel J. B. Hance, C.I.E., O.B.E., an Agency Surgeon, is granted leave for 2 months, with effect from the afternoon of the 15th October, 1940.

PROMOTIONS

The undermentioned General Officers are granted the local rank of Lieutenant-General:—

3rd October, 1940

Major-General W. H. Hamilton, C.B., C.I.E., C.B.E., D.S.O., K.H.P., D. M. S. in India.

Major-General G. G. Jolly, C.I.E., K.H.P., Director-General, Indian Medical Service.

Major to be Lieutenant-Colonel

F. H. Whyte. Dated 17th October, 1940.

Captains to be Majors

F. M. Khan. Dated 3rd April, 1939.
H. Min Sein. Dated 26th July, 1939.
A. W. West. Dated 3rd August, 1939.
S. P. Bhatia. Dated 12th October, 1939.
J. O'Neill. Dated 23rd April, 1940.
M. K. Bryce. Dated 3rd August, 1940.
J. L. O'Neill. Dated 3rd August, 1940.
W. J. Stewart. Dated 3rd August, 1940.
M. Ata-ullah. Dated 20th October, 1940.

RETIREMENT

Lieutenant-Colonel G. C. Maitra. Dated 10th November, 1940.

Notes

GLAXO LABORATORIES PRODUCTS

WE have just received a very neat catalogue of the products of this laboratory.

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